



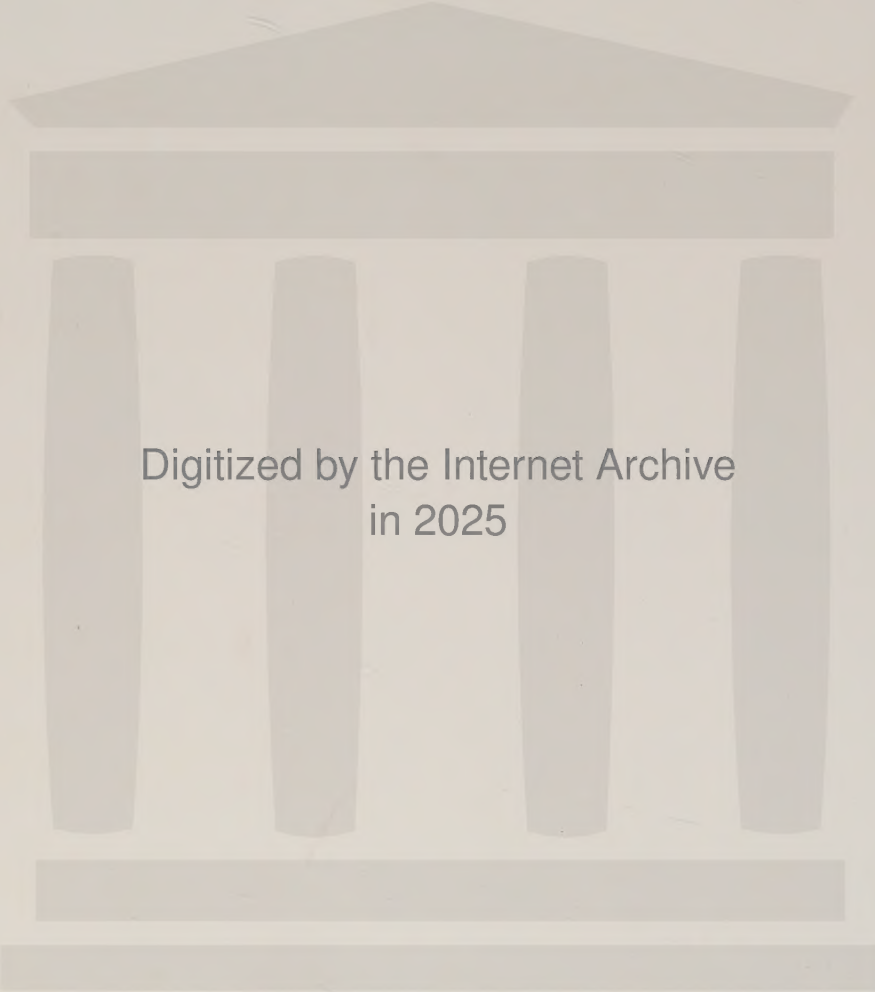
SECOND EDITION

100 THINGS

EVERY DESIGNER NEEDS TO KNOW ABOUT **PEOPLE**

SUSAN M. WEINSCHENK, Ph.D.





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Susan Weinschenk

Peachpit Press

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DEDICATION

Dedicated to the memory of Miles and Jeanette Schwartz. Wish you were here to share the book with.

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THE PSYCHOLOGY OF DESIGN

Whether you're designing a website, an app, software, or a medical device, the more you know about people, the better experience you will be able to design for your audience.

Your audience's experience is profoundly impacted by what you know—or don't know—about them.

How do they think? How do they decide? What motivates them to click or purchase or whatever it is you want them to do?

You'll learn these things in this book.

You'll also learn what grabs attention, what errors people make and why, and other things that will help you design.

And you'll design better because I've already done most of the heavy lifting for you. I'm one of those strange people who like to read research. Lots and lots of research. So I read—or in some cases, re-read—dozens of books and hundreds of research articles. I picked my favorite theories, concepts, and research studies and combined them with the experience I've gained throughout the many years I've been designing technology interfaces.

And you're holding the result: 100 things I think you need to know about people.

Note about the second edition: When I wrote the first edition of this book, I hoped, of course, that it would be a popular, widely read book. But I didn't know if people would respond to it or not. It's been a surprise and a heart warming experience to have the reaction to the book be so positive. The first edition has been translated into several languages and used as a textbook in many universities, and people often show me their well-used book with marks and sticky notes and highlights.

It's been several years since I wrote the first edition, and most of the material has stood the test of time. There is some new research, however, so I decided it was time to do a second edition. I've done updates, and tweaked explanations, wordings, and images, to make sure the book stays current.

A big thank-you to all my readers for your support.

Susan Weinschenk, Ph.D.

Edgar, WI

June 2020

HOW PEOPLE SEE

Vision trumps all the senses. Half of the brain's resources are dedicated to seeing and interpreting what we see. What our eyes physically perceive is only one part of the story. The images coming in to our brains are changed and interpreted. It's really our brains that are "seeing."

1

WHAT YOU SEE ISN'T WHAT YOUR BRAIN GETS

You think that as you're walking around looking at the world, your eyes are sending information to your brain, which processes it and gives you a realistic experience of "what's out there." But the truth is that what your brain comes up with *isn't* exactly what your eyes are seeing. Your brain is constantly interpreting everything you see. Take a look at **Figure 1.1**, for example.

What do you see? At first you probably see a triangle with a black border in the background and an upside-down white triangle on top of it. Of course, that's not really what's there, is it? In reality there are merely lines and partial circles. Your brain creates the shape of an upside-down triangle out of empty space, because that's what it expects to see. This particular illusion is called a Kanizsa triangle, named for the Italian psychologist Gaetano Kanizsa, who developed it in 1955. Now look at **Figure 1.2**, which creates a similar illusion with a rectangle.

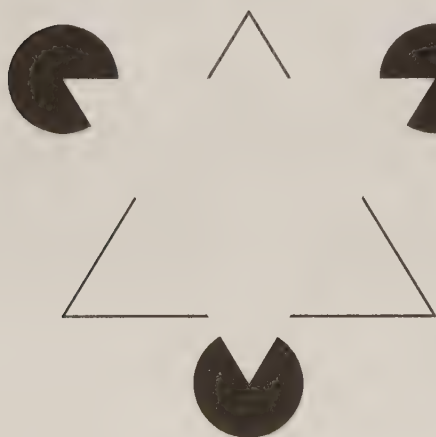


FIGURE 1.1 You see triangles, but they are not really there

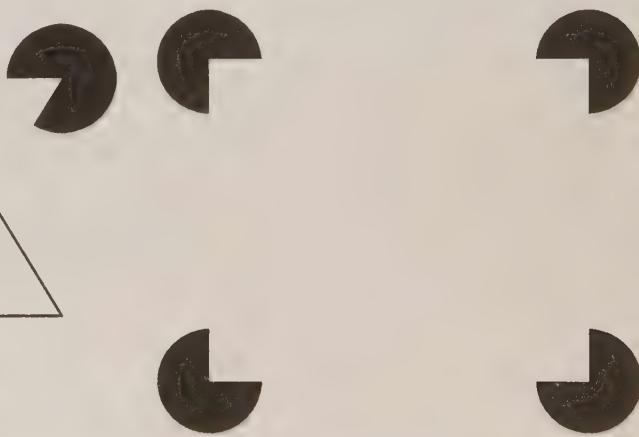


FIGURE 1.2 An example of a Kanizsa rectangle

THE BRAIN CREATES SHORTCUTS

Your brain creates these shortcuts in order to quickly make sense out of the world around you. Your brain receives millions of sensory inputs every second (the estimate is 40 million), and it's trying to make sense of all of that input. It uses rules of thumb, based

on past experience, to make guesses about what you see. Most of the time that works, but sometimes it causes errors.

You can influence what people see, or think they see, by the use of shapes and colors. **Figure 1.3** shows how color can draw attention to one message over another.

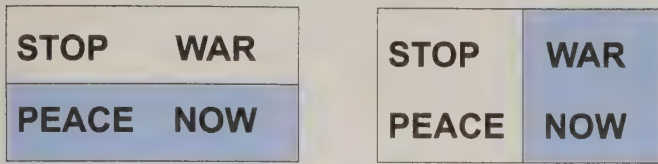


FIGURE 1.3 Color and shapes can influence what people see



If you want to see the world as it is, don't look at things directly.

The eye has 7 million cones that are sensitive to bright light and 125 million rods that are sensitive to low light. The cones are in the fovea (central area of vision), and the rods are less central. So if you're in low light, you'll see better if you don't look right at the area you're trying to see.



Optical illusions show us the errors

Optical illusions are examples of how the brain misinterprets what the eyes see. For example, in **Figure 1.4** the line on the left looks longer than the line on the right, but they're actually the same length. Named for Franz Müller-Lyer, who created it in 1889, this is one of the oldest optical illusions.

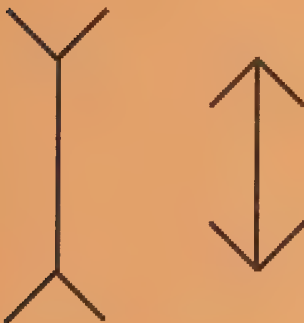


FIGURE 1.4 These lines are actually the same length



Light rays enter the eye through the cornea and lens. The lens focuses an image on the retina. On the retina it is always a two-dimensional representation, even if it is a three-dimensional object. This image is sent to the visual cortex in the brain, and that's where recognition of patterns takes place—for example, “Oh, I recognize that as a door.” The visual cortex turns the 2D image into a 3D representation.

Takeaways

- * What you think people are going to see when you design a product may or may not be what they actually see. What people see might depend on their background, knowledge, familiarity with what they are looking at, and expectations.
- * You might be able to persuade people to see things in a certain way, depending on how you present information and visual elements. You can use shading or colors to make it look like some things go together and others don't.

2

PERIPHERAL VISION IS USED MORE THAN CENTRAL VISION TO GET THE GIST OF WHAT YOU SEE

You have two types of vision: central and peripheral. Central vision is what you use to look at things directly and to see details. Peripheral vision encompasses the rest of the visual field—areas that are visible but that you're not looking at directly. Being able to see things out of the corner of your eye is certainly useful, but research from Kansas State University shows that peripheral vision is more important in understanding the world around us than most people realize. It seems that we get information on what type of scene we're looking at from our peripheral vision.



Why advertisements are so annoying

People can't help but notice movement in their peripheral vision. For example, if you're reading text on a screen and there's a video that starts to play off to the side, you can't help but look at it. This can be quite annoying if you're trying to concentrate on reading the text in front of you. This is peripheral vision at work! This is why advertisers use blinking and flashing in the ads that are at the periphery of web pages. Even though we may find it annoying, it does get our attention.

Adam Larson and Lester Loschky (2009) conducted research on central and peripheral vision in 2009, and Loschky conducted even more research in 2019. In the research they showed people photographs of common scenes, such as a kitchen or a living room, or outdoor scenes of cities and mountains. In some of the photographs the outside of the image was obscured, and in others the central part of the image was obscured (**Figure 2.1**). Then they asked the research participants to identify what they were looking at.

Loschky found that if the central part of the photo was missing, people could still identify what they were looking at. But when the peripheral part of the image was missing, they had a much harder time identifying what they were looking at. Loschky concluded that central vision is critical for specific object recognition, but peripheral vision is used for getting the gist of a scene.

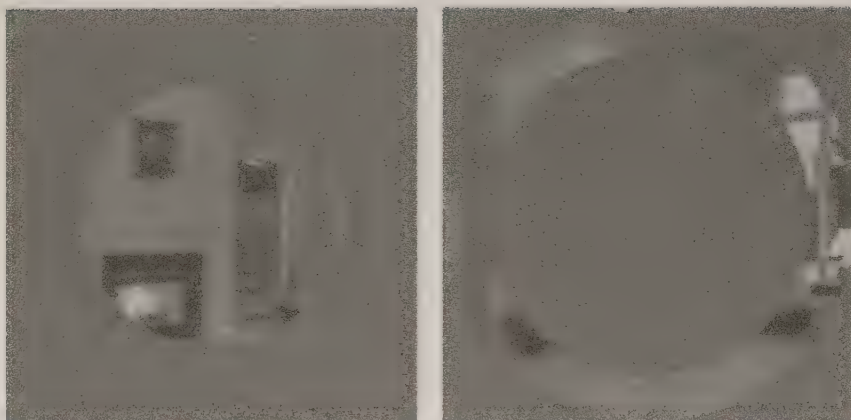


FIGURE 2.1 A photo used in the original Larson and Loschky research

If someone is looking at a desktop screen, you can assume that they are using both peripheral and central vision. The same is true if they are looking at a laptop screen or a large tablet. With mobile screens, depending on the size of the device, it is possible that there is no peripheral vision available on the screen.



Peripheral vision kept our ancestors alive on the savannah

The theory, from an evolutionary standpoint, is that early humans who were sharpening their flint or looking up at the clouds and yet still noticed that a lion was coming at them in their peripheral vision survived to pass on their genes. Those with poor peripheral vision didn't survive to pass on genes.

Additional research confirms this idea. Dimitri Bayle (2009) placed pictures of fearful objects in subjects' peripheral vision or central vision. Then he measured how long it took for the amygdala (the emotional part of the brain that responds to fearful images) to react. When the fearful object was shown in the central vision, it took from 140 to 190 milliseconds for the amygdala to react. But when objects were shown in peripheral vision, it took only 80 milliseconds for the amygdala to react.

Takeaways

- * If you are designing for a desktop or laptop screen, you should assume that people are using both peripheral and central vision.
- * Although the middle of the screen is important for central vision, don't ignore what is in viewers' peripheral vision. Make sure the information in the periphery communicates clearly the purpose of the page or information they are viewing.
- * If you have images of an emotional nature, put them in the periphery instead of in the middle.
- * If you want users to concentrate on a certain part of the screen, don't put animation or blinking elements in their peripheral vision.

3

PEOPLE IDENTIFY OBJECTS BY RECOGNIZING PATTERNS

Recognizing patterns helps you make quick sense of the sensory input that comes to you every second. Your eyes and brain want to create patterns, even if there are no real patterns there. In **Figure 3.1**, you probably see four sets of two dots each rather than eight individual dots. You interpret the white space, or lack of it, as a pattern.



FIGURE 3.1 Your brain wants to see patterns

THE GEON THEORY OF OBJECT RECOGNITION

There have been many theories over the years about how we see and recognize objects. An early theory was that the brain has a memory bank that stores millions of objects, and when you see an object, you compare it with all the items in your memory bank until you find the one that matches. But research now suggests that you recognize basic shapes in what you are looking at, and use these basic shapes, called geometric icons (or geons), to identify objects. Irving Biederman came up with the idea of geons in 1987 (**Figure 3.2**). It's thought that there are 24 basic shapes that we recognize; they form the building blocks of all the objects we see and identify.

If you want people to quickly recognize what an object is, you should make use of simple shapes. This makes it easier to recognize the basic geons that make up the shape. The smaller the object to recognize (for example, a small icon of a printer or a document), the more important it is to use simple geons without a lot of embellishment.

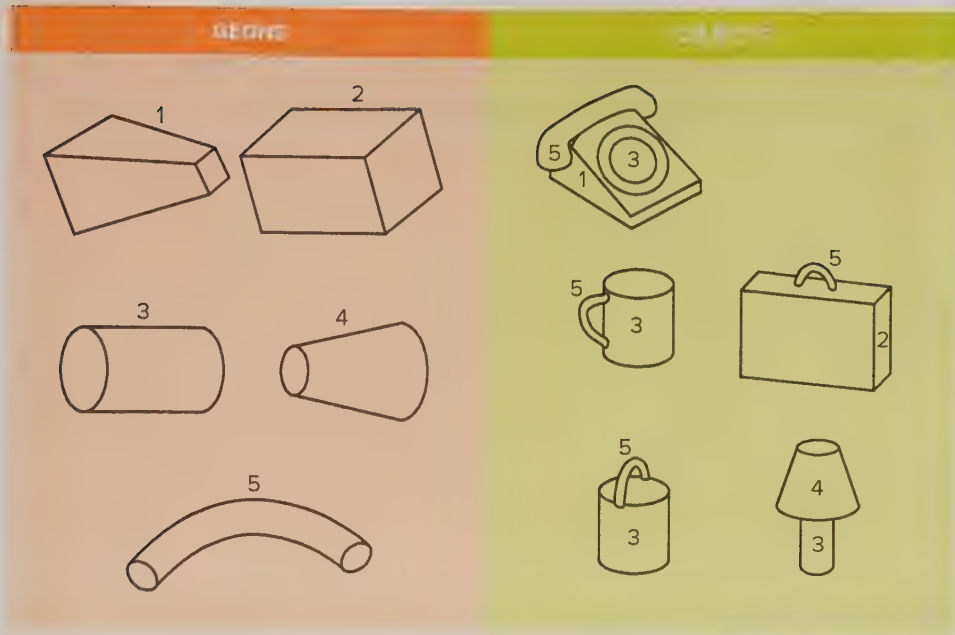


FIGURE 3.2 Some samples of Biederman's geons

Takeaways

- * Use patterns as much as possible, since people will automatically be looking for them. Use grouping and white space to create patterns.
- * If you want people to recognize an object (for example, an icon), use a simple geometric drawing of the object. This will make it easier to recognize the underlying geons and thus make the object easier and faster to recognize.

4

THERE'S A SPECIAL PART OF THE BRAIN JUST FOR RECOGNIZING FACES

Imagine that you're walking down a busy street in a large city when you suddenly see the face of a family member. Even if you were not expecting to see this person and even if there are dozens or even hundreds of people in your visual field, you will immediately recognize him or her as your relative. You'll also have an accompanying emotional response, be it love, hate, fear, or otherwise.

Although the visual cortex is huge and takes up significant brain resources, there is a special part of the brain outside the visual cortex whose sole purpose is to recognize faces. Identified by Nancy Kanwisher (1997), the fusiform face area (FFA) allows faces to bypass the brain's usual interpretive channels and helps us identify them more quickly than objects. The FFA is also near the amygdala, the brain's emotional center.

This means that faces grab our attention and also evoke an emotional response. If you show faces in your design, on a page or screen, it will grab attention immediately and convey emotional information.

If you want to use faces to grab attention and evoke an emotional response, make sure that the face is facing forward (not in profile), large enough to be easily seen, and showing the emotion you want to convey.



RESEARCH NOTE: AUTISM AND FACE RECOGNITION

Research by Karen Pierce (2001) showed that people with autism don't use the FFA when looking at faces. Instead, they use other, regular pathways in the brain and visual cortex that are normally used to recognize and interpret objects but not faces.



We look where the face looks

Eye-tracking research shows that if a face in a picture looks away from us and toward a product on a web page (**Figure 4.1**), we tend to also look at the product.

But remember, just because people look at something, it doesn't mean they're paying attention. You'll have to decide whether you want to establish an emotional connection (the face looking right at the viewer) or to direct attention (the face looking directly at a product).



FIGURE 4.1 We look where the person looks



People are born with a preference for faces

Research by Catherine Mondloch et al. (1999) shows that newborns less than an hour old prefer looking at something that has facial features. The FFA's sensitivity to faces appears to be something we are born with.



The eyes have it: people decide who and what is alive by looking at the eyes

Christine Looser and T. Wheatley (2010) took pictures of people and then morphed them in stages into inanimate mannequin faces. In the research, subjects are shown the stages and asked to decide when the picture is no longer a human and alive. **Figure 4.2** shows examples of the pictures. Their research found that subjects say the pictures no longer show someone who is alive at about the 75 percent mark. They also found that people primarily use the eyes to decide whether a picture shows someone who is human and alive.



FIGURE 4.2 An example of Looser and Wheatley's people-to-mannequin faces

Takeaways

- * People recognize and react to faces quickly, so if you want to grab attention, show faces.
- * Faces that are looking straight out at the viewer will have the greatest emotional impact, probably because the eyes are the most important part of the face.
- * If a face in a picture or on a web page is looking at another part of the page or at a specific item or product, then the people viewing the image will also tend to look at that place or product. This doesn't necessarily mean that they will pay attention to it or take action. It just means that they will look at it.

THERE'S A SPECIAL PART OF THE BRAIN FOR PROCESSING SIMPLE VISUAL FEATURES

In 1959, David Hubel and Torsten Wiesel showed that some cells in the visual cortex respond only to horizontal lines, others respond only to vertical lines, others respond only to edges, and still others respond only to certain angles.

The theory for many years has been that the retina receives electrical patterns from what we look at and creates several tracks from the patterns. Some tracks contain information about shadows, others about movement, and so on. As many as 12 tracks of information are then sent to the brain's visual cortex. In the visual cortex special areas respond to and process the information. For example, one area responds only to lines that are tilted to 40 degrees, another only to color, another only to motion, and another only to edges.

Eventually all of the data are combined into just two tracks: one for movement (is this object moving?) and another for location (where is this object in relation to me?).

WELL, MAYBE NOT JUST ONE AT A TIME

Hubel and Wiesel's research held for 60 years. But more recent research, by Garg (2019), shows that there might be neurons that process two features at a time: color and orientation. Still, the idea is that the visual information is processed in small bits, one or maybe two features at a time.

This means that if you want to grab visual attention, the best way to do it is to have one element look different from any others. Have one item be a different color. Or have one item be a different shape.

Compare the image in **Figure 5.1** to the one in **Figure 5.2**. In the first image only one circle is a different color, so you notice it right away. In Figure 5.2 all the circles are different colors, which means that no particular circle stands out.



FIGURE 5.1 If only one circle is a different color, then it stands out.



FIGURE 5.2 When everything is a different color, then nothing stands out.



The visual cortex is more active when you are imagining

The visual cortex is more active when you are imagining something than when you are actually perceiving it (Solso, 2005). Activity occurs in the same location in the visual cortex, but there is more activity when we imagine. The theory is that the visual cortex has to work harder because the stimulus is not actually present.

A mistake that designers sometimes make is to use several of these visual features together. If on one page or in one image you have several different colors, shapes, and angles, it may take the visual cortex longer to process that information. You won't be as effective in grabbing visual attention.

Takeaways

- * If you want to grab visual attention quickly, then remember that less is more.
- * In an image or on a page, whatever item is a different color, shape, or orientation than the others is the item that will grab attention first.
- * You will grab more attention if you use just one feature at a time. But if you are going to use two, then the two to use together are color and orientation (tilt or angle).

6

PEOPLE SCAN SCREENS BASED ON PAST EXPERIENCE AND EXPECTATIONS

Where do people look first on a screen or page? Where do they look next? It depends partially on what they're doing and expecting. If they read in a language that moves from left to right, they tend to look at the screen from left to right. If they read from right to left, the opposite is true.

Most people, though, don't start in the topmost corner. Because people have gotten used to the idea that there are things on screens and pages that are less relevant to the task at hand, such as logos and blank space, they tend to use their central vision to look for meaningful information about 30 percent in from the edge and 30 percent in from the top. In **Figure 6.1** the menu bar and the link to get started with Medicare are pulled in and down about 30 percent from the top and the sides, which is where most people will start looking for important information.

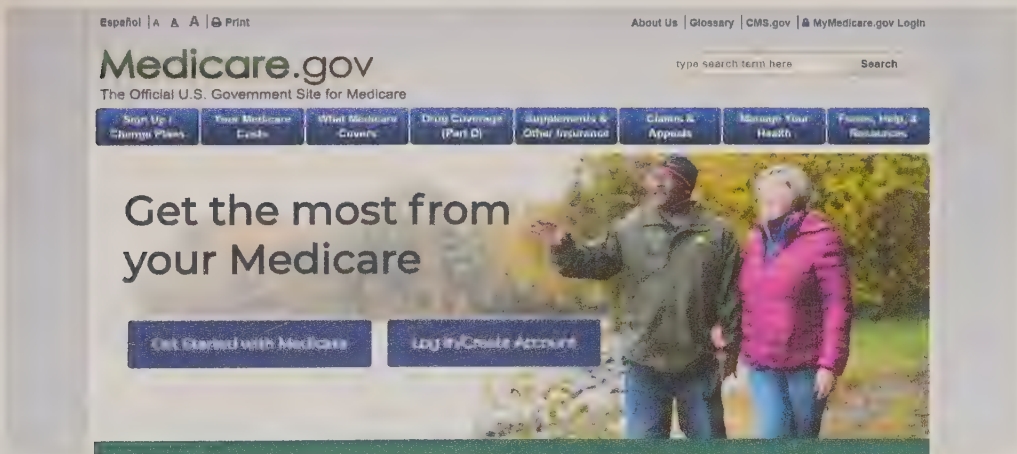


Figure 6.1 The menu bar and the link to get started with Medicare are placed where most people will look for meaningful information on a page

After a first glance at a screen, people move in their culture's normal reading pattern (left to right, or right to left, and top to bottom). If something grabs their attention somewhere else on the screen—for example, a large photo (especially one with someone's face) or movement (an animated banner or video)—then you can pull them away from this normal tendency.

PEOPLE HAVE A MENTAL MODEL OF WHAT THEY WANT TO SEE AND WHERE THEY WANT TO SEE IT

People have a mental model of where things tend to be on screens or pages, and a mental model for particular applications or websites that they use. They tend to look at a screen based on these mental models. For example, if they shop at Amazon a lot and use the search field, they'll likely look right at where they expect the search field to be.

IF THERE IS A PROBLEM, PEOPLE NARROW THEIR VIEW

If there is an error or unexpected problem with the task people are trying to accomplish, then they stop looking at other parts of the screen and focus on the problem area. We'll discuss this more in the "People Make Mistakes" chapter.

Takeaways

- ✧ Put the most important information (or things you want people to focus on) about 30 percent of the page or screen from the top and 30 percent from the left margin (or from the right margin if they are reading in a language that moves from right to left).
- ✧ Avoid putting task-related information at the edges, since people tend not to look there with central vision.
- ✧ Save the edges for peripheral vision, which may include images with emotion or anything that will give the "gist" of the scene—for example, logos, branding, and navigation menus.
- ✧ Design the screen or page so that people can move in their normal reading pattern. Avoid a pattern that forces people to bounce back and forth to many parts of the screen to accomplish a task.

7

PEOPLE SEE CUES THAT TELL THEM WHAT TO DO WITH AN OBJECT

You've probably had the experience of encountering a door handle that doesn't work the way it should: the handle looks like you should pull, but in fact you need to push. In the real world, objects communicate to you about how you can, and should, interact with them. For example, by their size and shape, doorknobs invite you to grab and turn them. The handle on a coffee mug tells you to curl a few fingers through it and lift it up. A pair of scissors invites you to put fingers through the circles and move your thumb up and down to open and close. If the item, like the door handle, gives you cues that don't work, you get annoyed and frustrated. These cues are called *affordances*.

James Gibson wrote about the idea of affordance in 1979. He described affordances as *action possibilities* in the environment. In 1988 Don Norman modified the idea of affordances in his book *The Design of Everyday Things*. He referred to the idea of *perceived* affordances: if you want people to take action on an object, whether in real life or on a computer screen, you need to make sure that they can easily perceive, figure out, and interpret what the object is and what they can and should do with it.

When you try to accomplish a task, such as opening a door to a room or ordering a book on a website, you automatically, and largely unconsciously, look around you to find objects and tools to help you. If you are the one designing the environment for the task, make sure that the objects in the environment are easy to see, are easy to find, and have clear affordances.

Take a look at the door handle in **Figure 7.1**. Because of its shape, you'll tend to grab it and pull down. If that's the way it works, then you'd say that the door handle is well designed and that it has a clear perceived affordance.



FIGURE 7.1 This door handle invites you to grab and pull down

You've probably encountered a door handle that is shaped in a way that invites you to grab and pull, but then also has a PUSH sign. When the cue doesn't match the function, then you end up having to post confusing messages so that people know how to interact with the object. When an object is giving cues that go against how it really works, that is known as providing an *incorrect affordance*.

PERCEIVED AFFORDANCES ON SCREENS

When you're designing an application or website, think about the affordances of objects on the screen. For example, have you ever wondered what makes people want to click a button? Cues in the button's shadow tell people that it can be pushed in, the way a button on an actual device can be pushed in.

Figure 7.2 shows a button on a remote control. The shape and shadows give you cues that encourage you to press the button to activate it.



FIGURE 7.2 Buttons on physical devices have shadows that make you want to press them

You can simulate these shadows online too. In **Figure 7.3**, shadows of different colors around the edges make the button look pushed in. Try turning the book upside down and looking at the same button. Now it will look like it's not pushed in, and the shadows will give cues to push the button.



FIGURE 7.3 This button looks pushed in, but turn the book upside down and see what happens

These visual cues are subtle, but they are important. Many buttons have some of these visual cues, such as the button in **Figure 7.4**, but lately buttons are losing the cues. In **Figure 7.5**, the button is just text in a colored square.

And if someone is using a touch screen or tablet instead of a mouse or trackpad, then a button might not have any visual cues, such as an arrow or a hand with a finger pointing up.



FIGURE 7.4 The use of shading makes this look like a button

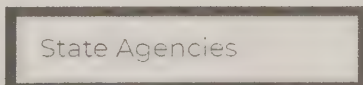


FIGURE 7.5 Buttons are losing their cues

HYPERLINKS ARE LOSING THEIR AFFORDANCE CUES TOO

Most people have figured out the affordance cue that blue, underlined text means that the text is hyperlinked, and if you click, it you will go to the linked site or page. But lately many hyperlinks are more subtle, with the only cue that they are clickable showing up when you hover.

Figure 7.6 shows a page that has no initial affordance cues about what can be clicked. (You need to hover over something to find out what's clickable.) To see links, you have to wander over the page with your finger on your mouse.

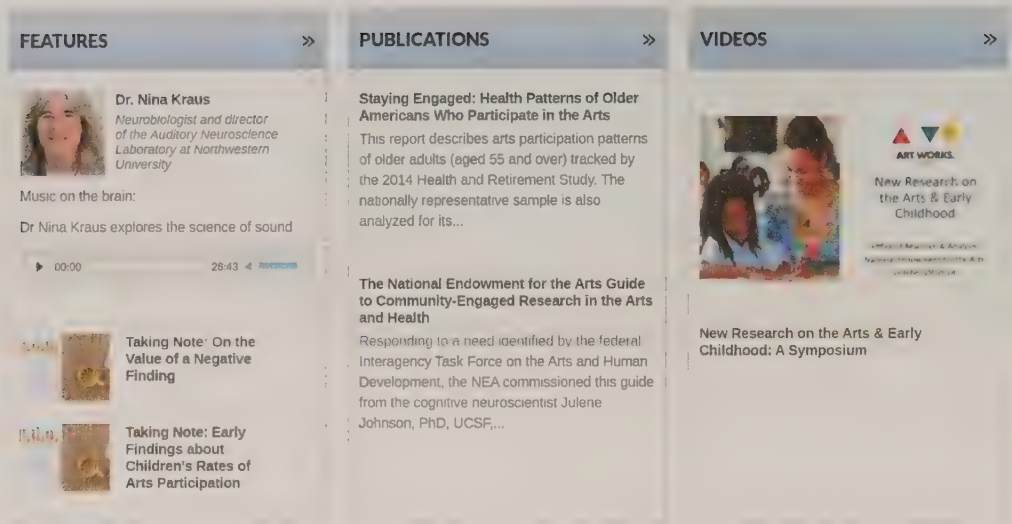


FIGURE 7.6 It's not clear what's clickable and what isn't

Takeaways

- * Think about affordance cues when you design. By giving people cues about what they can do with a particular object, you make it more likely that they will take that action.
- * Use shading to show when an object is chosen or active.
- * Avoid providing incorrect affordance cues.

8

PEOPLE CAN MISS CHANGES IN THEIR VISUAL FIELDS



Spelling alert

If you haven't seen what is famously called the "gorilla video," then you should check out the first video on my blog: www.blog.theteamw.com/2009/10/25/100-things-you-should-know-about-people-1-inattention-blindness/. Take the Selective Attention Test. If you don't do this now, then I will spoil the effect for you below as I discuss the video.

The "gorilla video" is an example of *inattention blindness* or *change blindness*. The idea is that people often miss large changes in their visual fields. This has been shown in many experiments, although the basketball/gorilla experiment is the best known.

In their book *The Invisible Gorilla*, Christopher Chabris and Daniel Simons (2010) describe additional research they did with eye-tracking equipment. Eye tracking is a technology that can track where someone is looking. More specifically, it tracks where the foveal, or central, gaze is. It doesn't track peripheral vision. Eye-tracking research shows that everyone watching the basketball/gorilla video "sees" the gorilla in the video, meaning that their central vision is looking at the gorilla, but only 50 percent are aware that they have seen the gorilla. Chabris and Simons have conducted many studies on this phenomenon, and they have concluded that if you are paying attention to one thing and you don't expect changes to appear, then you can easily miss changes that do occur.



Eye-tracking data can be misleading

Eye tracking is a technology that allows you to see and record what a person is looking at, in what order, and for how long. It is often used to study where people are looking, either on a screen, on a page, or even in a physical environment. It can track where people look first, second, and so on. One of its benefits is that you don't have to rely on what people say they are looking at, but instead you can collect the data directly. But eye-tracking data can be misleading for several reasons: 1) As we've discussed in this section, eye tracking tells you what people looked at, but that doesn't mean that they paid attention to it. 2) The research on peripheral vision in this chapter tells us that peripheral

vision is just as important as central vision. Eye tracking measures only central vision.

3) Early eye-tracking research by Alfred Yarbus (1967) showed that what people look at depends on what questions they are asked while they are looking. It's therefore easy to accidentally skew the eye-tracking data depending on what instructions you give participants before and during the study.

Takeaways

- * Don't assume that people will see something on a screen or page just because it's there. This is especially true when you refresh a screen and make one change on it—for example, the screen reappears with a message about an incorrect piece of data entered in a form field. Users may not even realize they are looking at a different screen.
- * If you want to be sure that people notice a change in their visual field, add additional visual cues (such as blinking) or auditory cues (such as a beep).
- * Be cautious about how you interpret eye-tracking data. Don't ascribe too much importance to it or use it as the main basis for design decisions.

9

PEOPLE BELIEVE THAT THINGS THAT ARE CLOSE TOGETHER BELONG TOGETHER

If two items are near each other (a photo and text, for example), then people assume they go together. This connection is strongest for items that are together left to right.

In **Figure 9.1**, the distance between columns is the same as the distance between rows. This makes it difficult to know which headings and photos belong together. Because the left-to-right connection is stronger than the top-to-bottom connection—and in the absence of any other visual cues—most people will assume that a heading on the left goes with the picture to its right. This is not the case, which makes the page hard to use.



FIGURE 9.1 It's hard to tell which heading goes with which photo

Takeaways

- ✱ If you want items (pictures, photos, headings, or text) to be seen as belonging together, then put them in proximity.
- ✱ Before you use lines or boxes to separate items or group them together, first try experimenting with the amount of space between them. Sometimes changing the spacing is sufficient, and you'll be reducing the visual noise of the page.
- ✱ Put more space between items that don't go together and less space between items that do. This sounds like common sense, but many page and screen layouts ignore this idea.

10

RED AND BLUE TOGETHER ARE HARD
ON THE EYES

When lines or text of different colors are projected or printed, the depths of the lines may appear to be different. One color may jump out while another color appears recessed. This effect is called *chromostereopsis*. The effect is strongest with red and blue, but it can also happen with other colors (for example, red and green). These color combinations can be hard and tiring to look at or read. **Figure 10.1** shows some examples of chromostereopsis.



FIGURE 10.1 Chromostereopsis can be hard on the eyes

Takeaways

- * Avoid putting blue and red or green and red near each other on a page or screen.
- * Avoid blue or green text on a red background, and red or green text on a blue background.

NINE PERCENT OF MEN AND ONE-HALF PERCENT OF WOMEN ARE COLOR-BLIND

The term color blindness is actually a misnomer. Most people who are “color-blind” are not blind to all colors, but really have a color deficiency that makes it hard for them to see differences between some colors. Most color blindness is hereditary, although some can be acquired through disease or injury. Most of the color genes are on the X chromosome. Since men have only one X chromosome and women have two, men are more likely to have problems with color vision than women.

There are many different kinds of color blindness, but the most common is a difficulty distinguishing between reds, yellows, and greens. This is called “red-green” color blindness. Other forms, such as problems distinguishing blues from yellows, or where everything looks gray, are very rare.

Figure 11.1 shows a map of winter driving conditions from the Wisconsin Department of Transportation’s website as it appears to someone who has no color blindness. **Figure 11.2** shows the same page as a person with red-green color blindness would see it, and **Figure 11.3** shows the same page as a person with blue-yellow color deficiency would see it. Notice that the colors are different.

The rule of thumb is that wherever you use color to give specific meaning, you need a redundant coding scheme—for example, color *and* line thickness—so that people who are color-blind will be able to decipher the code without needing to see specific colors.

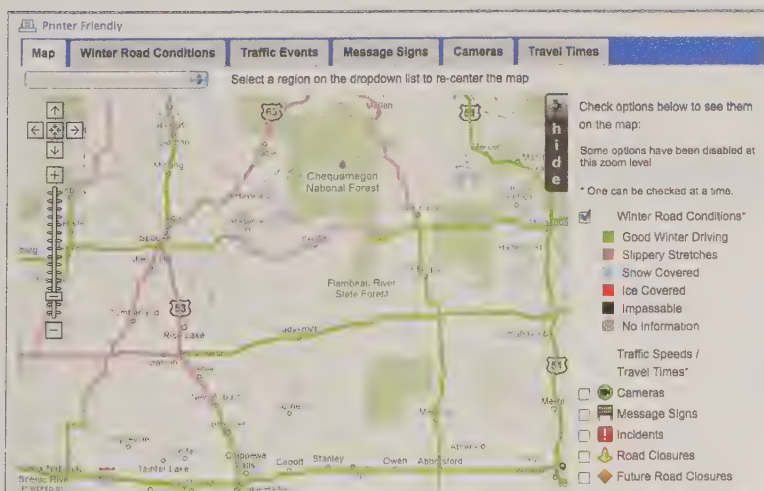


FIGURE 11.1 Full-color vision

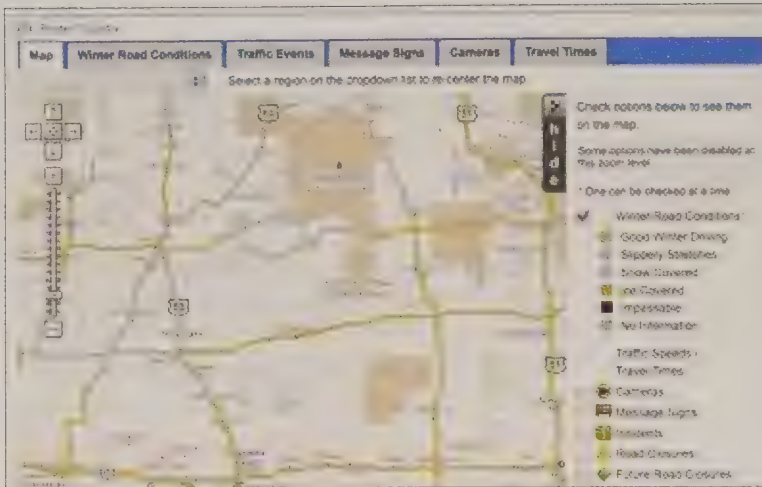


FIGURE 11.2 Red-green color deficiency

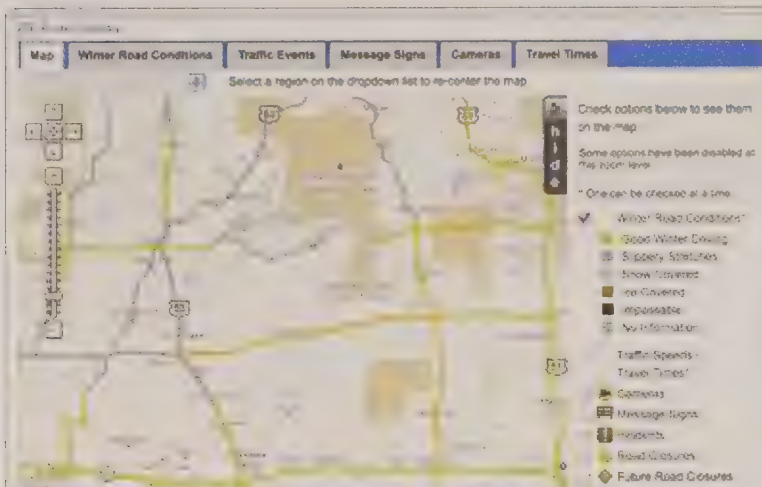


FIGURE 11.3 Blue-yellow color deficiency

Another approach is to pick a color scheme that works for people who have the various types of color blindness. **Figures 11.4, 11.5, and 11.6** are from a website that shows the spread of influenza for a particular week. At this site they have purposely picked colors that look the same for people regardless of the type of color blindness they have, and even if they are not color-blind. The three instances of the web page look almost exactly the same.

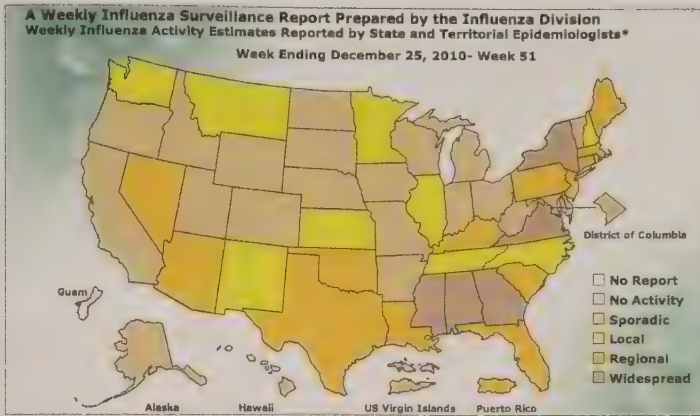


FIGURE 11.4 Full-color vision (www.cdc.gov)

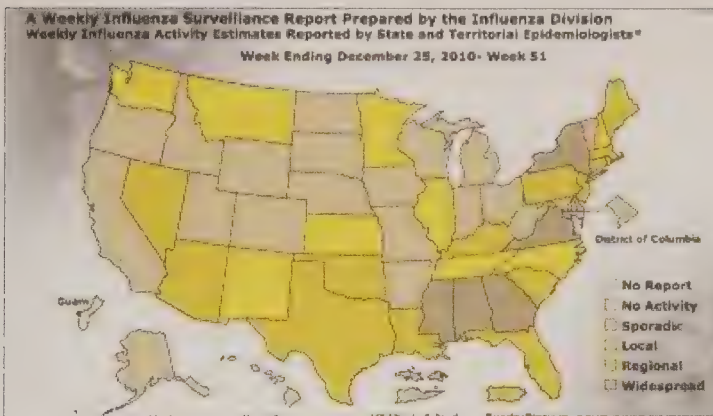


FIGURE 11.5 Red-green color deficiency (www.cdc.gov)

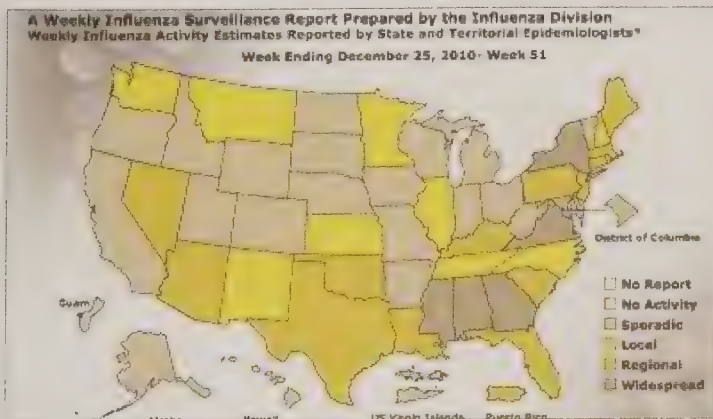


FIGURE 11.6 Blue-yellow color deficiency (www.cdc.gov)



USE WEBSITES TO CHECK FOR COLOR BLINDNESS EFFECTS

There are several sites you can use to check how your images or website will appear to someone who has color blindness. Here are two I recommend:

www.vischeck.com

colorfilter.wickline.org



Those who are color-blind can often see camouflage better

Some say it is because they are not distracted by color, while others say it is because those who are color-blind are used to looking for pattern, texture, or other cues. Regardless of the reason, some color-blind individuals can see camouflage better than those who have full-color vision.

Takeaways

- * Check your images and websites with www.vischeck.com or colorfilter.wickline.org to see how they will look to someone who is color-blind.
- * If you use color to imply a certain meaning (for example, items in green need immediate attention), use a redundant coding scheme (items in green and with a box around them need immediate attention).
- * When designing color coding, consider colors that work for everyone—for example, varying shades of brown and yellow.

COLORS MEAN DIFFERENT THINGS TO DIFFERENT CULTURES

I once worked with a client who had created a color map of the different business regions for their company, showing the total revenue for the quarter for each region. Yellow was for the eastern part of the U.S., green for the central states, and red for the western states. The VP of Sales got to the podium and started showing his slide deck to the financial and accounting staff of the company. Up came the colored map and a gasp could be heard in the auditorium, followed by the buzz of urgent conversation. The VP tried to continue his talk, but he had lost everyone's attention. They were all talking amongst themselves.

Finally someone blurted out, "What the heck is going on in the West?"

"What do you mean?" the VP asked. "Nothing is going on. They had a great quarter."

To an accountant or financial person, red is a bad thing. It means they are losing money. The presenter had to explain that he had just randomly picked red.

Colors have associations and meanings. For example, red means "in the red," or financial trouble, or it could mean danger or stop. Green means money or "go." Pick colors carefully because they have these meanings. And different colors might mean different things to subgroups.

If you are designing for people in different parts of the world, then you also have to consider the color meanings in other cultures. A few colors have similar meanings everywhere (gold, for example, stands for success and high quality in most cultures), but most colors have different meanings in other cultures. For example, in the U.S. white is used at weddings, but in other cultures white is the color used for death and funerals. Happiness is associated with white, green, yellow, or red, depending on the part of the world you are in.



InformationIsBeautiful.net

David McCandless of InformationIsBeautiful.net has a color wheel that shows how different colors are viewed by different cultures: www.informationisbeautiful.net/visualizations/colours-in-cultures/.



Research on color and moods

Research shows that colors affect mood. The restaurant and hospitality industry has studied this a lot. For example, in the U.S. orange makes people agitated, so they won't stay long (useful in fast food restaurants). Browns and blues are soothing, so people will stay (useful in bars). However, in order for a color to affect mood, the person has to be sitting in a room surrounded by that color. The effect does not seem to work if he or she is simply looking at a screen that has a particular color on it.

Takeaways

- * Choose your colors carefully, taking into account the meaning that the colors may invoke.
- * Pick a few major cultures or countries that you will be reaching with your design and check them on the cultural color chart from InformationIsBeautiful.net to be sure you're avoiding unintended color associations for that culture.

HOW PEOPLE READ

With adult literacy rates now over 80 percent worldwide, reading is a primary form of communication for most people. But how do we read? And what should designers know about reading?

13

IT'S A MYTH THAT WORDS IN ALL CAPS ARE INHERENTLY HARD TO READ

You've probably heard that words in uppercase letters are harder to read than those in mixed case or lowercase. You've probably even heard some kind of percentage cited, such as "between 14 and 20 percent harder." The story goes that we read by recognizing the shapes of words and groups of words. Words in mixed case or lowercase letters have unique shapes. Words in all caps have the same shape—a rectangle of a certain size—so, in theory, they're harder to distinguish (**Figure 13.1**).

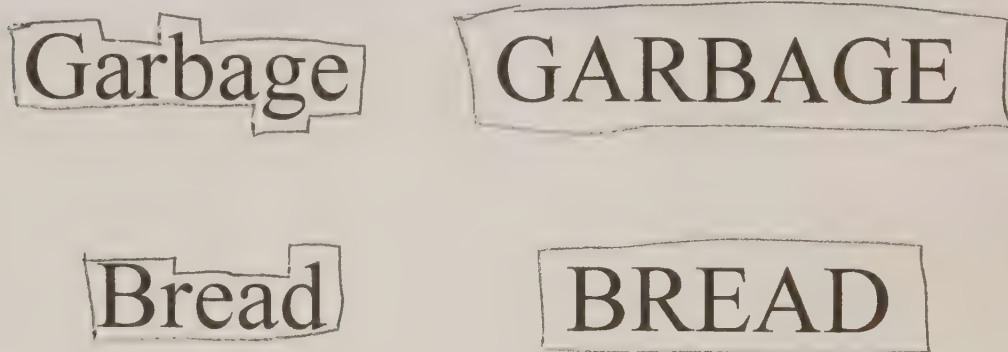


FIGURE 13.1 The word shape theory

This explanation sounds plausible, but it's not really accurate. There's no research showing that the shapes of words help us read more accurately or more quickly. A psycholinguist named James Cattell came up with that idea in 1886. There was some evidence for it then, but more recent work by Kenneth Paap (1984) and Keith Rayner (1998) has revealed that what we're actually doing when we read is recognizing and anticipating letters. And then, based on the letters, we recognize the word. Let's look more closely at how we read.

READING ISN'T AS FLUID AS IT SEEMS

When we read, we have the impression that our eyes are moving smoothly across the page, but that's not what's actually happening. Our eyes move in quick, sharp jumps, with short periods of stillness in between. The jumps are called saccades (about seven to nine letters at a time), and the moments of stillness are called fixations (about 250

milliseconds long). During the saccades, we can't see anything—we're essentially blind—but the movements are so fast that we don't even realize they're happening. Our eyes look forward during most of the saccades, but they look backward 10 to 15 percent of the time, rereading letters and words.

Figure 13.2 shows an example of the saccade and fixation pattern. The black dots are the fixations, and the curved lines are the saccade movements.

Fortunately these saccades are really fast so you are not blind for long.

They are so fast that you don't even realize they are happening.

FIGURE 13.2 An example of a saccade and fixation pattern



We use peripheral vision when we read

A saccade spans about seven to nine letters, but our perceptual span is actually double that. In 1996, Kenneth Goodman found that we use peripheral vision to see what comes next when we read. We read ahead about 15 letters at a time, viewing the characters to the right (assuming we're reading left to right), although now and then a saccade jumps us backward and we reread a group of letters. Although we read ahead about 15 letters at a time, we only get the meaning for part of that span. We pick up the semantic cues of letters 1 through 7, but merely recognize letters 8 through 15.



Reading music is similar to reading text

People who read music fluently use the same saccades, fixations, and reading ahead of 15 “letters” that they do when reading text.

SO IS IT HARDER TO READ TEXT THAT IS IN ALL CAPS?

We *do* actually read uppercase letters more slowly, but only because we don't see them as often. Most of what we read is in mixed case, so we're used to seeing mixed case. If you practice reading text in all caps, you'll eventually read that text as fast as you read mixed case. This doesn't mean you should start using all caps for all your text. Since people are unused to reading that way, it will initially slow them down. And these days, text in all caps is perceived as “shouting” (**Figure 13.3**).

THE DOCUMENTATION SUBMITTED
WAS FOR THE INCORRECT DATES OF
SERVICE. REFER TO THE PROGRAM
INTEGRITY SUPPORT FILE.

FIGURE 13.3 We perceive text in all caps as shouting, but it isn't inherently harder to read



A good example of this comes from all caps

Kevin Larson wrote a great article summarizing the research on uppercase versus mixed case:

www.microsoft.com/typography/ctfonts/wordrecognition.aspx

Takeaways



People perceive all caps as shouting, and they're unused to reading text in all caps, so use all caps sparingly.



Save all caps text for headlines and when you need to get someone's attention (for example, before deleting an important file).

READING AND COMPREHENDING ARE TWO DIFFERENT THINGS

If you're a biologist, then this paragraph might make sense right away:

The regulation of the TCA cycle is largely determined by substrate availability and product inhibition. NADH, a product of all of the dehydrogenases in the TCA cycle, with the exception of succinate dehydrogenase, inhibits pyruvate dehydrogenase, isocitrate dehydrogenase, and α -ketoglutarate dehydrogenase, while succinyl-CoA inhibits succinyl-CoA synthetase and citrate synthase.

If you're not a biologist, then it might take you a long time to understand what that paragraph says. You can read the paragraph, but that doesn't mean you understand it. New information is assimilated more thoroughly when it is plugged into existing cognitive structures.

READABILITY FORMULAS

There are formulas you can use to calculate the readability of a particular passage of text. An example is the Flesch-Kincaid formula. It provides both a reading ease score and a reading grade-level score. The higher the score, the easier the passage is to read. Low scores mean the passage is hard to read. The formula is shown in **Figure 14.1**.

$$206.835 - 1.015 \left(\frac{\text{total words}}{\text{total sentences}} \right) - 84.6 \left(\frac{\text{total syllables}}{\text{total words}} \right)$$

FIGURE 14.1 The Flesch-Kincaid readability formula

There are several other formulas as well, but none of them is perfect, so use them with caution. Most readability formulas are based on the average length of words and sentences. The assumption is that if a passage of text has long words and long sentences, then it will be harder to read. The formulas don't take into account whether the specific terminology or vocabulary will be hard for a specific audience to read or understand.

Many of the formulas give you a "grade-level" score—for example, that the passage of text is at an eighth-grade reading level or a tenth-grade reading level. If you use different formulas on the same text passage, you are likely to get some variation in the grade-level score.

This means that readability formulas are not exact and not perfect, yet they can give you an idea of how easy or hard a particular text passage will be to read.

Here are some guidelines if you are writing for a general consumer audience:

- ★ Text at a sixth-grade or lower level is easy to read.
- ★ Text from a seventh- to ninth-grade level is of average difficulty.
- ★ Text at a tenth-grade or above level is difficult.



An example of calculating readability

There are several tools for calculating readability.

I tested a text passage from one of my blog articles by copying and pasting the text into a readability formula website: <https://readabilityformulas.com/freetests/six-readability-formulas.php>.

Here is the text I tested:

"But doing nothing so you can then be better at doing something seems to run counter to the idea of *niksen*. What about doing nothing so that you just do nothing?"

"I've been teaching an 8-week Mindfulness Meditation course once or twice a year at my local yoga studio (a wonderful place called 5 Koshas in Wausau, Wisconsin). The 8-week class includes homework, such as practicing the meditation we learned in class that week every day at home, and so on. It's a pretty intensive class.

"The last time I taught it I added to the homework. I asked students to practice 5 minutes a day of *niksen*. I asked them to sit in nature or stare out their window, or sit in a comfy chair at home and look at the fire in the fireplace, or just stare into space. This was the one thing I got pushback on. They were willing to practice meditation for 20 minutes every day, but to sit and do nothing for 5 minutes? 'I don't have the time to do that' was the typical answer. 'I have responsibilities, children, work...'"

The website used several different formulas to calculate readability. Here are the scores it gave me:

Flesch reading ease score: 76.3, fairly easy to read

Flesch-Kincaid grade level: seventh grade

Gunning Fog: 8.4, fairly easy to read

Coleman-Liau index: sixth grade

SMOG index: sixth grade

The summary was:

Grade Level: Seventh; Reading Level: fairly easy to read

CAN YOU READ THIS PARAGRAPH?

Even though the words are scrambled, chances are that you can read this paragraph anyway. The order of the letters in each word is not very important. But the first and last letter must be in the right position. The other letters can be all mixed up and you can still read without a lot of problems. This is because reading is all about anticipating the next word.

When you read, you don't absorb exact letters and words and then interpret them later. You anticipate what will come next. The more previous knowledge you have, the easier it is to anticipate and interpret.

TITLES AND HEADLINES ARE CRITICAL

Read this paragraph:

First you sort the items into like categories. Using color for sorting is common, but you can also use other characteristics, such as texture or type of handling needed. Once you have sorted the items, you are ready to use the equipment. You want to process each category from the sorting separately. Place one category in the machine at a time.

What is the paragraph about? It's hard to understand. But what if I give you the same paragraph with a title:

Using your new washing machine

First you sort the items into like categories. Using color for sorting is common, but you can also use other characteristics, such as texture or type of handling needed. Once you have sorted the items, you are ready to use the equipment. You want to process each category from the sorting separately. Place one category in the machine at a time.

The paragraph is still poorly written, but now at least it is understandable.



People use different parts of the brain to process words

Words are processed in different parts of the brain depending on what you're doing with them. Viewing or reading words, listening, speaking, generating verbs—all of these word activities engage different parts of the brain, as shown in **Figure 14.2**.



Passively viewing words



Listening to words



Speaking words



Generating verbs

FIGURE 14.2 Different parts of the brain process words

WHAT YOU REMEMBER OF WHAT YOU READ DEPENDS ON YOUR POINT OF VIEW

In a study by Anderson and Pichert (1978), people read a story about a house and the contents within the house. One group was told to read the story from a buyer's standpoint, and another group was told to read the story from a burglar's point of view. The information they remembered after reading the story differed depending on their viewpoint.

Takeaways

- * People are active readers. What they understand and remember from what they read depends on their previous experience, their point of view while reading, and the instructions they are given beforehand.
- * Don't assume that people will remember specific information in what they read.
- * Provide a meaningful title or headline. It's one of the most important things you can do.
- * Tailor the reading level of your text to your audience. Use simple words and fewer syllables to make your material accessible to a wider audience.

15

PATTERN RECOGNITION HELPS PEOPLE IDENTIFY LETTERS IN DIFFERENT FONTS

People have been debating which fonts are better, easier to read, or most appropriate for centuries. One such debate centers around the use of two types of font: serif versus sans serif. Some argue that sans serif typefaces are easier to read because they are plain; others contend that serif fonts are easier to read because the serifs draw the eye toward the next letter. In fact, research shows no difference in comprehension, reading speed, or preference between serif and sans serif fonts.



People identify letters through pattern recognition

How is it that you can recognize all of the marks in **Figure 15.1** as the letter A?



FIGURE 15.1 We can recognize many variations of a letter

You haven't memorized all of these versions of the letter A. Instead you've formed a memory pattern of what an A looks like. When you see something similar, your brain recognizes the pattern. (See the discussion of geons in the chapter called "How We See" for more information about how we recognize shapes.)

Designers use fonts to evoke a mood, brand, or association. Some font families invoke a time period (old fashioned versus modern), while others convey seriousness or playfulness. In terms of readability, however, the font you choose is not critical as long as it's not so decorative as to make it hard to identify the letters; some fonts interfere with the brain's ability to recognize patterns.

Figure 15.2 shows different decorative fonts. The first font is relatively easy to read; the others become progressively more difficult. They make it hard for the brain to recognize the patterns of the letters.

There are many fonts that are easy to read. Any of them are fine to use. But avoid a font that is so decorative that it starts to interfere with pattern recognition in the brain.

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There are many fonts that are easy to read. Any of them are fine to use. But avoid a font that is so decorative that it starts to interfere with pattern recognition in the brain.

FIGURE 15.2 Some decorative fonts are readable, but others are less so



Want more about how to choose the right font for your design?

If you're interested in reading the research about font type, typography, and readability, check out this great website:

<http://alexpoole.info/blog/which-are-more-legible-serif-or-sans-serif-typefaces/>

IF A FONT IS HARD TO READ, PEOPLE THINK THE TASK IS HARD TO DO

Hyunjin Song and Norbert Schwarz (2008) gave people written instructions on how to do a physical exercise. If the instructions were in an easy-to-read font (such as Arial), people estimated that it would take about eight minutes to do the exercise and that it wouldn't be too difficult. They were willing to incorporate the exercise into their daily workout. But if the instructions were given in an overly decorative font (such as Brush Script MT Italic), people estimated it would take almost twice as long—15 minutes—to do the exercise, and they rated the exercise as being difficult to do (**Figure 15.3**). They were also less likely to be willing to incorporate it into their routine.

Tuck your chin into your chest, and then lift your chin upward as far as possible. 6-10 repetitions.

Lower your left ear toward your left shoulder and then your right ear toward your right shoulder. 6-10 repetitions.

Tuck your chin into your chest, and then lift your chin upward as far as possible. 6-10 repetitions.

Lower your left ear toward your left shoulder and then your right ear toward your right shoulder. 6-10 repetitions.

FIGURE 15.3 If the text used for instructions is hard to read, as it is in the second text sample, the reader likewise will think the instructions are hard to do

Takeaways

- ✱ Serif and sans serif fonts are equal in terms of readability.
- ✱ Unusual or overly decorative fonts can interfere with pattern recognition and slow down reading.
- ✱ If people have trouble reading the font, they will transfer that feeling of difficulty to the meaning of the text itself and decide that the subject of the text is hard to do or understand.

When it comes to fonts, size matters a lot. The font size needs to be big enough for users to read the text without strain. And it's not just older individuals who need fonts to be bigger—young people also complain when font sizes are too small to read.

Some fonts can be the same size but look bigger due to the x-height. The x-height is literally the height of the lowercase x in the font family. Different fonts have different x-heights, and as a result, some fonts look larger than others, even though they are the same point size.

Figure 16.1 shows how font size and x-height are measured.

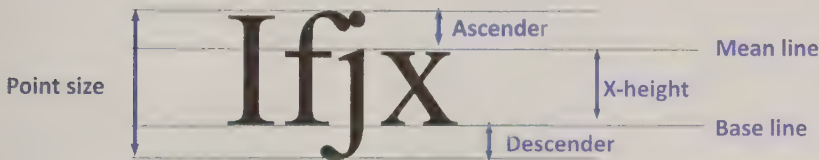


FIGURE 16.1 How font size and x-height are measured

Some newer font families, such as Tahoma and Verdana, have been designed with large x-heights so they are easier to read on a screen. **Figure 16.2** shows different font families that are all the same point size. Some look bigger, however, because of their larger x-height.

All the fonts in this illustration are the same size, but some look larger than others because the x-height of different font families vary. This one is Arial.

All the fonts in this illustration are the same size, but some look larger than others because the x-height of different font families vary. This one is Times New Roman.

All the fonts in this illustration are the same size, but some look larger than other because the x-height of different font families vary. This one is Verdana.

All the fonts in this illustration are the same size, but some look larger than others because the x-height of different font families vary. This one is Tahoma.

FIGURE 16.2 Large x-heights can make a font look larger

Takeaways

- * Choose a point size that is large enough for people of various ages to read comfortably.
- * Consider using a font with a large x-height so that the type will appear to be larger.

READING A SCREEN IS HARDER THAN READING PAPER

Reading text on a screen is different from reading text on paper. When you read on a screen, the image is not stable—it is being refreshed, and the screen is emitting light. When you read text on paper, the image is stable (not being refreshed), and instead of emitting light, the paper is reflecting light. The refreshing of the image and emitting of the light on the screen are tiring on the eyes. Electronic ink (as in the Kindle) mimics the appearance of ink on paper. It reflects light and holds the text stable without refreshing.

To make text on a screen easier to read, make sure you use a large enough font and create enough contrast between foreground and background. **Figure 17.1** shows the best combination to use for readability: black text on a white background

In order to make text readable make sure that you have enough contrast between the text and the background.

White text on a black background is hard to read

Make sure you have enough contrast between the text and the background

In order to make text readable make sure that you have enough contrast between the text and the background.

The best combination for readability is black text on a white background

FIGURE 17.1 Black text on a white background is easiest to read

Takeaways

- ★ Use a large point size for text that will be read on a screen. This will help minimize eyestrain.
- ★ Break text up into chunks. Use bullets, short paragraphs, and pictures.
- ★ Provide ample contrast between foreground and background. Black text on a white background is the most readable.
- ★ Make sure your content is worth reading. In the end, it all boils down to whether or not the text on the page is of interest to your audience. Make sure you know what your audience wants or needs to read and then provide them with that content as clearly as possible.

18

PEOPLE READ FASTER WITH A LONGER LINE LENGTH, BUT THEY PREFER A SHORTER LINE LENGTH

Have you ever had to decide what column width to use on a screen? Should it be a wide column, with 100 characters per line? Or a short column, with 50 characters per line? Or something in between? The answer depends on whether you want people to read faster or to like the page.

Mary Dyson (2004) conducted research on line length and combed other studies to determine what line length people prefer. Her work showed that 100 characters per line is the optimal length for onscreen reading *speed*, but we *prefer* a short or medium line length (45 to 72 characters per line).



Every time you get to the end of a line, you interrupt saccade and fixation eye movement. A shorter line length creates more of these interruptions over the total length of the piece you are reading.

Every time you get to the end of a line, you interrupt saccade and fixation eye movement. A shorter line length creates more of these interruptions over the total length of the piece you are reading.

 The research also found that we can read a single wide column faster than multiple columns, but we prefer multiple columns.

If you ask people which they prefer, they will say multiple columns with short line lengths. Interestingly, if you ask them which they read faster, they will insist it is also the multiple columns with short line lengths, even though the data shows otherwise.

Figure 18.1 is an example of a long line length. **Figure 18.2** is an example of a short line length.

Line length presents a quandary: Do you give people the short lines and multiple columns that they prefer or go against their own preference and intuition, knowing that they will read faster if you use longer lines and a single column? You have to decide what is more important for the particular content you are providing and the particular audience who is reading. For each instance, which is more important, speed or preference?

HUD APPROVES SETTLEMENT INVOLVING CALIFORNIA HOUSING PROVIDERS ACCUSED OF DISCRIMINATING AGAINST FAMILIES WITH CHILDREN

WASHINGTON - The U.S. Department of Housing and Urban Development (HUD) announced today it has approved a Conciliation Agreement between Oberhauser Trust, in Escondido, and its leasing agent, First Core Group, Inc. doing business as Keller Williams Realty, in Glendale, California, settling claims that the leasing agent allegedly denied a father of two children the opportunity to rent a condominium. [Read the agreement.](#)

The Fair Housing Act prohibits housing providers from denying or limiting housing to families with children under age 18, including refusing to negotiate and making discriminatory statements based on familial status.

"Families today face enough challenges without being denied a place to call home because they have children," said Anna Maria Farias, HUD's Assistant Secretary for Fair Housing and Equal Opportunity. "HUD will continue working to ensure that housing providers meet their obligation under the Fair Housing Act to treat home seekers with children equally."

The case came to HUD's attention after a father of two and his father-in-law filed a complaint alleging that the father was denied the opportunity to rent a condominium because he has two young daughters who would be living with him part-time. The father alleged that the leasing agent refused to consider his application for the unit, saying, "I don't want to waste your time or mine. Sorry." The owner and leasing company deny that they discriminated against the family but agreed to settle the complaint.

Under the terms of the agreement, the owners and brokerage agency will pay \$10,000 to the father and will revise their fair housing policy to contain provisions that there are no preferences against renting or selling properties to families with children. In addition, representatives of the owners and their leasing agents will attend fair housing training.

People who believe they have experienced discrimination may file a complaint by contacting HUD's Office of Fair Housing and Equal Opportunity at (800) 669-9777 (voice) or (800) 927-9275 (TTY). Housing discrimination complaints may also be filed by going to hud.gov/fairhousing.

FIGURE 18.1 A long line length

ARTS & HUMAN DEVELOPMENT TASK FORCE »	ARTS EDUCATION PARTNERSHIP »	BLUE STAR MUSEUMS »
Beginning in 2011, the NEA has convened a Federal Interagency Task Force on the Arts and Human Development to encourage more and better research on how the arts can help people reach their full potential at all stages of life	The Arts Education Partnership, a collaboration among the NEA, the U.S. Department of Education, and the Education Commission of the States as well as all AEP partner organizations, convenes forums to discuss topics in arts education, publishes research materials supporting the role of arts education in schools, and acts as a clearinghouse for arts education resource material	Blue Star Museums is a collaboration among the NEA, Blue Star Families, the Department of Defense, and more than 2,000 museums in all 50 states that offers free admission to active-duty military personnel and their families during the summer
CITIZENS' INSTITUTE ON RURAL DESIGN »	CREATIVE FORCES »	INTERNATIONAL »
The Citizens' Institute on Rural Design (CIIRD) is a leadership initiative of the National Endowment for the Arts in partnership with the Housing Assistance Council and buildingcommunityWORKSHOP. Focusing on communities with populations of 50,000 or less, CIIRD's goal is to enhance the quality of life and economic viability of rural America through planning, design, and creative placemaking.	Creative Forces: NEA Military Healing Arts Network places creative arts therapies at the core of patient-centered care at 11 clinical sites throughout the country, plus a telehealth program, and increases access to therapeutic arts activities in local communities for military members, veterans, and their families. These programs serve the unique and special needs of military patients who have been diagnosed with traumatic brain injury and psychological health	Through cooperative initiatives with other funders, the National Endowment for the Arts brings the benefit of international exchange to arts organizations, artists, and audiences nationwide. NEA's international activities increase recognition of the excellence of U.S. arts around the world and broaden the scope of experience of American artists, thereby enriching the art they create

FIGURE 18.2 A short line length

For example, if you are presenting updated information to medical professionals on a web page about the latest outbreak of a virus, you may want to consider a longer line length to promote reading speed. The audience is already motivated to read the content (they want the latest update as fast as possible), so speed is important. Use a longer line length, for example 80 to 100 characters per line. 

On the other hand, if you are writing content on the newest modern art exhibit at your local art museum and you are hoping that the art lovers in your community will read the article and then want to come see the exhibit, you should probably choose a shorter line length to entice them to read the article. If the line length is too long, they may not stick around to read it. Use 45 to 72 characters per line.



Takeaways



You have to decide what is more important for the particular content you are providing and the particular audience who is reading. For each instance, which is more important, speed or preference?



Use a longer line length (80 to 100 characters per line) if your reader needs to read quickly.



Use a shorter line length (45 to 72 characters per line) if your reader doesn't necessarily need to read quickly.

HOW PEOPLE REMEMBER

Let's start with a memory test. Read over the following list of terms for about 30 seconds, and then keep reading the chapter:

Meeting

Computer

Phone

Work

Papers

Chair

Presentation

Pen

Shelf

Office

Staff

Table

Deadline

Whiteboard

Secretary

We'll come back to this list later. First, let's learn about the frailties and complexities of human memory.

We've all experienced this moment: you're on the phone and the person you're talking to gives you the name and number of someone you need to call right away. You don't have a pen or paper to write down the information, so you repeat the name and number over and over to help yourself remember them. You try to get off the phone quickly so you can make the call while the number is still running through your head. You may find that your memory isn't very reliable in this situation.

Psychologists have many theories about how this type of memory works; some refer to it as short-term memory, others as working memory. In this chapter we'll call this type of quick memory—the memory you need for less than a minute—*working memory*.

WORKING MEMORY AND FOCUSED ATTENTION

There's only so much people can hold in working memory before they forget it. Information in working memory is easily interfered with. For example, if you're trying to remember a name and phone number and someone starts talking to you at the same time, you're probably going to get very annoyed. You're also going to forget the name and number. If you don't concentrate, you'll lose it from working memory. This is because working memory is tied to your ability to focus attention. To maintain information in working memory, you must keep your attention focused on it.



The brain lights up when working memory is active

Theories about memory date to the 1800s. Now researchers can use functional magnetic resonance imaging (fMRI) technology to actually see which parts of the brain are active when people perform various tasks and engage with different images, words, and sounds. When a task involves working memory, the prefrontal cortex (which focuses attention) lights up. Other parts of the brain are also active during tasks that employ working memory. For example, if the task includes remembering words or numbers, then there will also be activity in the left hemisphere. If the task involves spatial relations, such as finding something on a map, then the right hemisphere will also be active.

Perhaps the most interesting finding is that the connection between these areas of the brain and the prefrontal cortex increases when working memory is in use. While working memory is active, the prefrontal cortex is choosing strategies and deciding what to pay attention to; this has a significant impact on memory.



Scans of the brain using fMRI show that there is less activity in the prefrontal cortex (the part of your brain right behind your forehead) when you're under stress. This indicates that stress reduces the effectiveness of working memory.

WORKING MEMORY VS. SENSORY INPUT

Interestingly, there is an inverse relationship between working memory and the amount of sensory input you're processing at any given time. People with high-functioning working memories are better able to screen out what's going on around them. Your prefrontal cortex determines what you should pay attention to. If you can tune out all the sensory stimuli around you and instead focus your attention on the one thing in your working memory, you'll be able to remember it.



More working memory equals better performance in school

Recent research links working memory and academic success. Tracy Alloway (2010) tested the working memory capacity of a group of five-year-olds and then tracked the children over time. Working memory at age five predicted how well the children did through high school and beyond: those with higher working memory capacities were more successful academically. This shouldn't be a surprise, since working memory is involved in remembering instructions from a teacher and, as we will discuss later, is part of long-term memory. What is interesting, though, is that working memory can be tested; then, if the child's score is low, the results can be used to plan an intervention. It's a relatively fast and easy way to find out which students are at risk for school problems, and it gives educators and parents the opportunity to tackle those problems early on.

Takeaways

- * Don't ask people to remember information from one place to another, such as reading letters or numbers on one page and then entering them on another page; if you do, they'll probably forget the information and get frustrated.
- * If you ask people to remember things in working memory, don't ask them to do anything else until they've completed that task. Working memory is sensitive to interference—too much sensory input will prevent them from focusing attention.

If you're familiar with usability, psychology, or memory research, you've probably heard the phrase "the magical number seven, plus or minus two." This refers, actually, to what I would call an urban legend: George A. Miller (1956) wrote a research paper showing that people can remember from five to nine (seven plus or minus two) things and that people can process seven plus or minus two pieces of information at a time. So you should only put five to nine items on a menu, or have five to nine tabs on a screen. Have you heard that story? Well, it's not quite accurate.

WHY IT'S AN URBAN LEGEND

Psychologist Alan Baddeley questioned the seven plus or minus two rule. Baddeley (1994) dug up Miller's paper and discovered that it wasn't a paper describing actual research; it was a talk that Miller gave at a professional meeting. And it was basically Miller thinking out loud about whether there is some kind of inherent limit to the amount of information that people can process at a time.

Baddeley (1986) conducted a long series of studies on human memory and information processing. Others, including Nelson Cowan (2001), followed in his footsteps. The research now shows that the "magical" number is four.

USING CHUNKS TO TURN FOUR INTO MORE

People can hold three or four things in working memory as long as they aren't distracted and their processing of the information is not interfered with.

One of the interesting strategies people employ to help our fragile memories is "chunking" information together into groups. It's no accident that U.S. phone numbers look like this:

712-569-4532

Instead of having to remember 10 separate numerals, a phone number has three chunks, with four or fewer items in each chunk. If you know the area code by heart (that is, it's stored in long-term memory), then you don't have to remember that part of the number, so you can ignore one whole chunk.

Years ago phone numbers were easier to remember because you mainly called people in your area code, so you didn't have to hold the area code in working memory.

It was in long-term memory, which we will get to shortly. In the good old days you didn't even need to use the area code if the number you were calling from was in the same area code as you were dialing from (not true anymore in most places). And to make it even easier, everyone in town had the same exchange (the 569 part of the previous phone number). If you were dialing someone in your town with the same exchange, all you had to remember was the last four numbers. No problem! (I know I'm dating myself here by telling you how it used to be back in the old days. I live now in a small town in Wisconsin, and people here still give their number to others as the last four digits only, even though just four numbers won't work anymore.)

THE FOUR-ITEM RULE APPLIES TO MEMORY RETRIEVAL TOO

The four-item rule applies not only to working memory but also to long-term memory. George Mandler (1969) showed that people could memorize information in categories and then retrieve it from memory perfectly if there were one to three items in a category. The number of items recalled dropped steadily when each category contained more than three items. If there were four to six items in a category, then people could remember 80 percent of the items. It went down from there, falling to 20 percent if there were 80 items in the category (**Figure 20.1**).

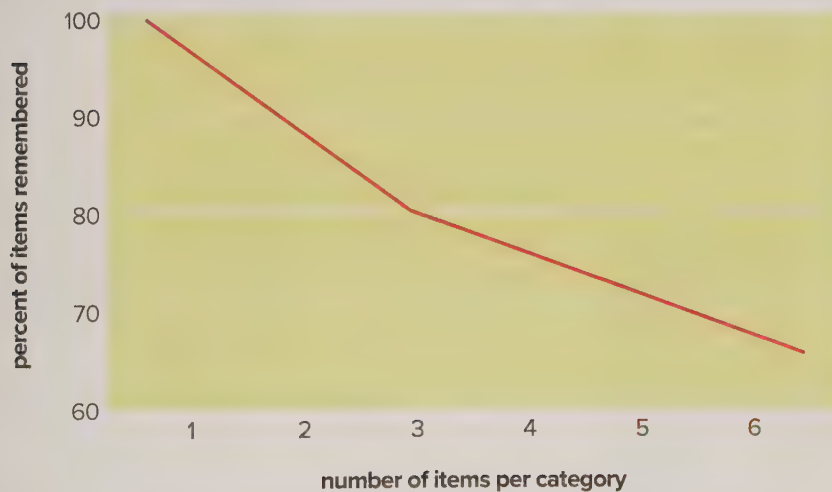


FIGURE 20.1 The more people are asked to recall, the less accurate their recollection is

Donald Broadbent (1975) asked people to recall items in different categories—for example, the Seven Dwarfs, the seven colors of the rainbow, the countries of Europe, or the names of current shows on TV. People remembered two, three, or four items clustered together.



Nobuyuki Kawai and Tetsuro Matsuzawa (2000) trained a chimpanzee to take memory tests similar to the ones that are given to humans. The chimpanzee (named Ai) could correctly complete the memory tasks with 95 percent accuracy when she had to memorize four numbers. She was only 65 percent correct when there were five numbers.

Takeaways

- * Limit the number of choices or items to three or four. For example, when you provide links that people can go to for more information, limit the number of links to three or four.
- * If you can't limit the number of links, topics, or choices to three or four, chunk or group information into three or four groups. For example, when you are asking people to choose what to do next, instead of showing them a list of 10 topics or items to click on, group like items together and show three or four groups with three or four items in each group.
- * When you chunk or group information, make sure there are no more than four items in each chunk.
- * Be aware that people tend to use external aids, sometimes called "job aids," when their working memory is being overloaded. If you observe people using your product and they have to refer to lists, notes, sticky notes, and so on while they are using the product, that is an indication that you are overloading working memory.

How do people move things from working memory into long-term memory? There are basically two ways: repeat it a lot, or connect it to something they already know.

REPETITION PHYSICALLY CHANGES THE BRAIN

There are 10 billion neurons in the brain that store information. Electrical impulses flow through a neuron and are moved by neuron-transmitting chemicals across the synaptic gap between neurons. Neurons in the brain fire every time we repeat a word, phrase, song, or phone number we are trying to memorize. Memories are stored as patterns of connections between neurons. When two neurons are activated, the connections between them are strengthened.

If we repeat the information enough times, the neurons form a firing trace. Once the trace is formed, then just starting the sequence triggers the rest of the items and allows us to retrieve the memory. This is why we need to hear information over and over to make it stick.

THE POWER OF A SCHEMA

If I ask you to describe what a “head” is, you might talk about the brain, hair, eyes, nose, ears, skin, neck, and other parts. A head is made up of many things, but you’ve gathered all that information together and called it “head.” Similarly I could talk about the “eye.” You would think about all the things that make up an eye: the eyeball, iris, eyelash, eyelid, and so on. The head is a schema. The eye is a schema. People use schemata (plural for schema) to store information in long-term memory and to retrieve it.

If people can connect new information to information that is already stored, then it’s easier to make it stick, or stay in long-term memory, and easier to retrieve it. Schemata allow people to build up these associations in long-term memory. Just one schema helps them organize a lot of information (**Figure 21.1**).



FIGURE 21.1 A head is made up of eyes, ears, nose, mouth, hair, and other parts. Combining those parts into one schema makes them easier to remember.

EXPERTS STORE INFORMATION AS SCHEMATA

The better people are at something, the more organized and powerful their schema about it will be. For example, players who are new to the game of chess need a lot of little schemata: the first schema might be how to set up the pieces on the board, the second might be how a queen can move, and so on. But expert chess players can pile a lot of information into one schema with ease. They can look at a chessboard in the middle of a game and tell you what some of the starting moves were, the strategies for each player, and what the next move is likely to be. They could certainly recite how to set up the board and how each piece can move. What would take many schemata for novice players, expert players can store in one schema. This makes retrieval of information faster and easier and makes it easier for the expert to put new information about chess into long-term memory. The expert can remember a lot of information as a single chunk (**Figure 21.2**).



FIGURE 21.2 For experts, everything on the chessboard is in one schema

Takeaways

- * If you want people to remember something, then you have to go over it again and again. Practice really does make perfect.
- * One of the major reasons to do user or customer research is so that you can identify and understand the schemata of your particular target audience.
- * If people already have a schema that relates to information that you are providing, make sure you point out what that schema is. It will be easier for them to learn and remember the information if they can plug it into an existing schema.

Remember the memory test at the start of this chapter? Without looking at the list, write down as many of the words as you can. We'll use this memory test to talk about recognition and recall.

RECOGNITION IS EASIER THAN RECALL

In the memory test at the beginning of this chapter, you memorized a list of words and later wrote them down. This is called a *recall task*. If instead I had shown you a list of words, or even walked you into an office and asked you which items were on the list, I would have been giving you a *recognition task*. Recognition is easier than recall. Recognition makes use of context. And context can help you remember.

Many of the user interface tools and guidelines developed over the years help reduce the memory load of using software and applications. Years ago there were no dropdown list boxes with choices or fields that started to fill automatically as soon as you started typing. These capabilities have improved the user experience of products primarily because they reduce the need for recall memory.

INCLUSION ERRORS

All the words you memorized were things related to an office. Look at what you wrote down, and compare your list with the original list at the beginning of the chapter. You probably wrote words that weren't even in the original list but that go with the "office" schema. For example, you might have written down "desk" or "pencil" or "boss." Consciously or unconsciously, you were aware that the list included things associated with an office. The schema probably helped you remember items on the list, but it might also have caused you to make errors of inclusion.



Children make fewer inclusion errors

When children under age five are shown items or pictures and then asked what they remember, they actually make fewer errors of inclusion than adults because their schemata are not as well formed.

Takeaways

- * Eliminate memory load whenever possible.
- * Make use of user interface features such as auto-fill and dropdown lists to reduce the need for people to recall items from memory.

The latest research on unconscious mental processing shows that people receive 40 billion sensory inputs every second and are consciously aware of 40 at any one time. Doesn't this mean that we can deal with and remember more than four things at a time? When you perceive a sensory input (for example, a sound, the feel of the wind on your skin, a rock that is in front of you), you perceive that something exists. You don't necessarily have to remember it or do something with the information. Conscious awareness of 40 things is different than consciously processing 40 bits of information. It takes a lot of mental resources to think about, remember, process, represent, and encode information.

MEMORY IS EASILY DISRUPTED

Imagine you're listening to a presentation at a conference. When the presentation is finished, you meet your friend in the lobby of the hotel. "What was the talk about?" she asks. You're most likely to remember what was seen and heard at the end of the talk. This is called the *recency effect*.

If your phone vibrates during a presentation and you stop listening for a minute to text someone, then you are most likely to remember the beginning of the presentation and forget the ending. This is called the *suffix effect*.



RESEARCH FINDINGS

You can store concrete words (table, chair) in long-term memory more easily than abstract words (justice, democracy).

When you're sad, you tend to remember sad things.

You can't remember much before the age of three.

You can remember things that you see (visual memory) better than you can remember words.



We sleep and dream so we will remember

Some of the best research happens through serendipity. In 1991 neuroscientist Matthew Wilson was studying brain activity in rats as they ran mazes. One day he accidentally left the rats hooked up to the equipment he used to record their brain activity. The rats eventually fell asleep. To his surprise he found that their brain activity was almost the same whether they were sleeping or running mazes.

Daoyun Ji and Wilson (2007) started a series of experiments to study this further. Their experiments have led them to a theory, not just about rats but about people too: when people sleep and dream, they are reworking, or consolidating, their experiences from the day. Specifically, they are consolidating new memories and making new associations from the information they processed during the day. Their brains are deciding what to remember and what to forget.



Why rhymes are easier to remember

Phonological (sound of words) coding can help retrieve information. Before there was written language, stories were memorized and retold in rhyming verse. The activation of one line in a verse more easily triggers the next verse. For example, you may have learned “Thirty days hath September, April, June, and November.” This is an example of phonological coding.

Takeaways

- * Use concrete terms and icons. They will be easier to remember than abstract ideas or images.
- * Let people rest (and even sleep) if you want them to remember information. If you are designing a process or service (for example, training simulations for pilots), remember to build in sleep.
- * Try not to interrupt people if they are learning or encoding information.
- * Information in the middle of a presentation is the least likely to be remembered.

Think back to a particular event that happened at least five years ago. Maybe it was a wedding, a family gathering, a dinner with friends, or a vacation. Remember the people and where you were. Maybe you can remember the weather or what you were wearing.

MEMORIES CHANGE

When you think about this event, it probably plays in your mind like a short movie clip. Because you experience memories this way, you tend to think that memories are stored in their entirety and never change, like an archived movie. But that's not what happens.

Memories are actually reconstructed every time we think of them. They're not movie clips that are stored in the brain in a certain location, like files on a hard drive. They are nerve pathways that fire anew each time we remember the event. This makes for some interesting effects. For example, the memory can change each time it is retrieved.

Events that occur after the original event can change the memory of the original event. At the original event, you and your cousin were close friends. But later on you have an argument and a falling-out that lasts for years. Over time when you recall the memory of the first event, it changes without you realizing it. It starts to include your cousin being aloof and cold, even if that is not true. The later experience has changed your memory.

You'll also start to fill in memory gaps with made-up sequences of events, but these will seem as real to you as the original event. You can't remember who else was at the family dinner, but Aunt Jolene is usually present at these events, and so over time your memory of the event will include Aunt Jolene, even if she wasn't there.

WHY EYEWITNESS TESTIMONIES ARE UNRELIABLE

In her research on reconstructive memory, Elizabeth Loftus (1974) showed participants a video clip of an automobile accident. Then she asked a series of questions about the accident and substituted critical words. For example, she might ask, "How fast would you estimate the car was going when it hit the other vehicle?" or "How fast would you estimate the car was going when it smashed the other vehicle?" And she asked the participants if they remembered seeing broken glass.

Notice the difference in using the word "hit" versus "smashed." When Loftus used the word "smashed," the estimated speed was higher than when she used the word "hit." And more than twice as many people remembered seeing broken glass if the word

“smashed” was used rather than the word “hit.” In later research Loftus was even able to inject memories of events that never happened.



Ask witnesses to close their eyes during recall

If witnesses close their eyes while trying to remember what they saw, their memories are clearer and more accurate (Perfect, 2008).



Memories can, indeed, be erased

Did you see *Eternal Sunshine of the Spotless Mind*? It's a movie about a business that erases particular memories. It turns out that is possible. Research by scientists at Johns Hopkins (Roger Clem, 2010) shows that memories can actually be erased.

THE IMPACT OF RECONSTRUCTED MEMORIES ON USER RESEARCH

Because we know that long-term memory might be faulty, it's important that you watch out for bias effects when you are conducting user research. It's better to observe what users do rather than ask them what they did in the past. And you need to be careful how you word your interview questions. The words you use may affect the response you get.

Takeaways

- * Choose your language carefully when you're getting feedback from your customers or users about a product. The words you use can affect what people “remember” and how they respond.
- * Don't rely entirely on self-reports of past behavior. People will not always remember accurately what they or others did or said.
- * Take what people say after the fact—when they are remembering using your product, for instance, or remembering the experience of calling your customer service line—with a grain of salt.

Forgetting things seems to be such a problem. At best it's annoying ("Where did I put my keys?"), and at worst it can send the wrong people to prison with inaccurate eyewitness testimonies. How could something so maladaptive have developed in humans? Why are we so flawed?

It's actually not a flaw. Think about all the sensory inputs and experiences you have every minute, every day, every year, and throughout your lifetime. If you remembered every single thing, you'd be unable to function; you have to forget some things. Your brain is constantly deciding what to remember and what to forget. It doesn't always make decisions that you find helpful, but in general, the decisions it makes (primarily unconsciously) are keeping you alive!

A FORMULA TO SHOW YOU HOW MUCH YOU WILL FORGET

In 1886, Hermann Ebbinghaus created a formula showing the degradation of memories:

$$R = e^{(-t/s)}$$

where R is memory retention, S is the relative strength of memory, and t is time.

The formula results in a graph that looks like **Figure 25.1**. It's called the forgetting curve, and it shows that we quickly forget information unless it's stored in long-term memory.



FIGURE 25.1 Hermann Ebbinghaus's forgetting curve

DESIGN WITH FORGETTING IN MIND

Don't assume that people will remember information. Provide the information that people need or an easy way to look it up.

Before option buttons and dropdown menus were available, most software made large demands on users to remember what data could be entered into a field. Now there are user interface elements—like option buttons and dropdown menus—that relieve the memory load and help people forget less often.

Figure 25.2 shows a typical situation in which a dropdown list box will help people remember what the options are.

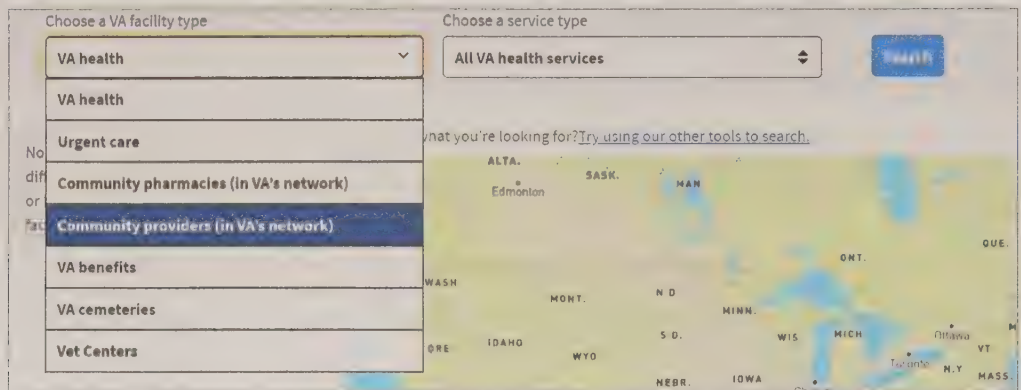


FIGURE 25.2 Dropdown menus help relieve memory load and minimize forgetting

Takeaways

- * People are always going to forget.
- * What people forget is not a conscious decision.
- * Design with forgetting in mind. When information is really important, don't rely on people to remember it. Provide it for them in your design or have a way for them to easily look it up. For example, use dropdown list boxes to show choices rather than assuming users will remember what to fill in.

If you are at least 30 years old and I asked you to recall where you were and what you were doing when you first heard about the September 11, 2001, attacks in New York City, chances are very good that you could tell me about that day in great detail. If you live in the U.S., and you were age 10 or older on that date, your memory would likely include details such as how you heard about the attacks, who you were with, and what you did the rest of that day. But research shows that a lot of, perhaps even most of, your memories would be wrong.

FLASHBULB MEMORIES ARE VIVID

Remembering traumatic or dramatic events in great detail is called flashbulb memory. Emotions are processed in the amygdala, which is very close to the hippocampus, which is involved in the long-term coding of information into memories. So it's no surprise to psychologists that emotionally laden memories might be very strong and remembered vividly.

VIVID BUT FULL OF ERRORS

Although flashbulb memories are vivid, they are also full of errors. In 1986 the space shuttle *Challenger* exploded. If you are old enough to recall that event, you probably remember it vividly. The day after this tragic event, Ulric Neisser, a professor who researches memories like these, had his students write down their memories of what had happened. Three years later he asked them to write their memory of the event again (Neisser, 1992). Over 90 percent of the later reports differed from the originals. Half of them were inaccurate in two-thirds of the details. One person, when shown the description she had written three years earlier, said, "I know that's my handwriting, but I couldn't possibly have written that." Similar research has been conducted on individuals with memories of the 9/11 attacks, with similar results.

The Ebbinghaus forgetting curve showed that memories degrade quickly over time. Because flashbulb memories are so vivid, it was thought that perhaps they were not as subject to forgetting as other memories. But it turns out they are. That's kind of disturbing when you think about it. Because these memories are so vivid, we tend to think they are more true. But we are wrong.

Takeaways

- * Dramatic or traumatic experiences will be remembered more vividly and more certainly than other types of memories.
- * Most of these dramatic or traumatic experiences will be remembered incorrectly.
- * No matter how certain people are of their memories of events, you need to assume that most long-term memories are not completely accurate.
- * If you are interviewing people and requiring them to remember events, keep in mind that what they say happened may be inaccurate.

HOW PEOPLE THINK

The brain has 23 billion neurons. That's a lot of capacity for mental processing. So what's going on in there?

Understanding how people think is crucial if you're going to design for them. Just as there are visual illusions, there are also thinking illusions. This chapter describes some of the interesting things the brain does as it makes sense of the world.

The brain can process only small amounts of information at a time—consciously, that is. (The estimate is that you handle 40 billion pieces of information every second, but only 40 of those make it to your conscious brain.) One mistake that designers sometimes make is giving too much information all at once.

APPLYING THE CONCEPT OF PROGRESSIVE DISCLOSURE

Progressive disclosure means providing only the information people need at the moment and letting them click to learn more about specific topics as they want or need to.

If you don't use progressive disclosure, you will end up with very long pages of information that may overwhelm your reader.

Take, for example, this page from the United States Social Security website. This is a section on benefits planning for survivors. The page is very long and has no progressive disclosure (**Figures 27.1, 27.2, 27.3**).

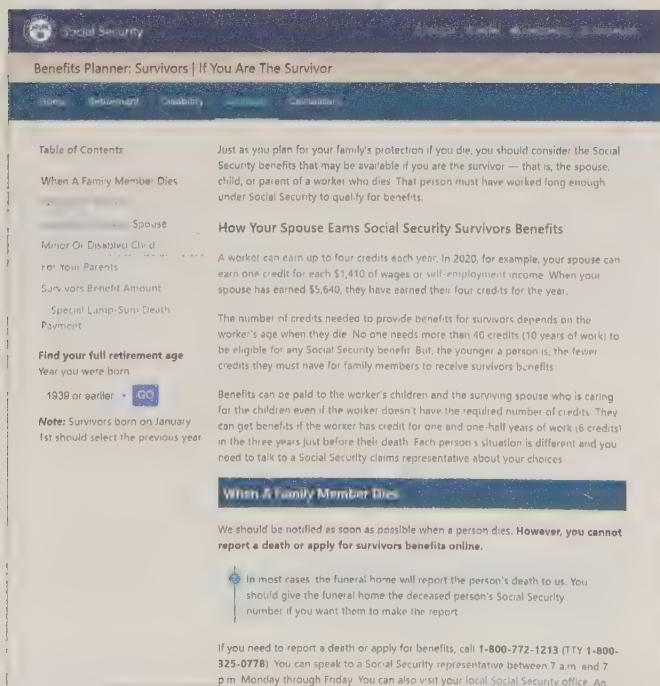


FIGURE 27.1 The first screen of the page

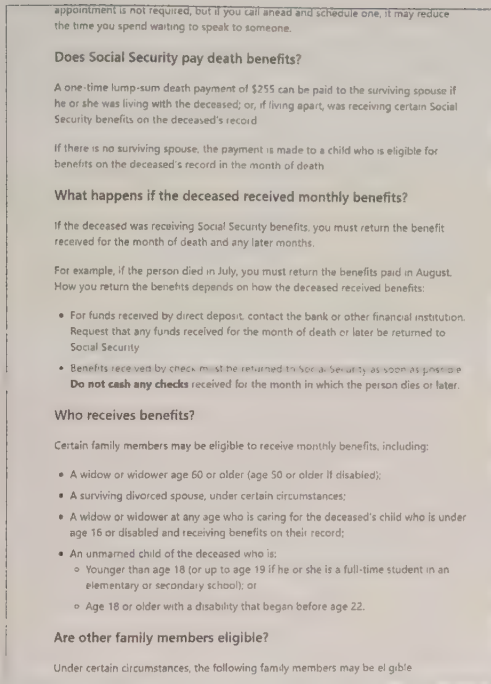


FIGURE 27.2 Scrolling down, still on the same page

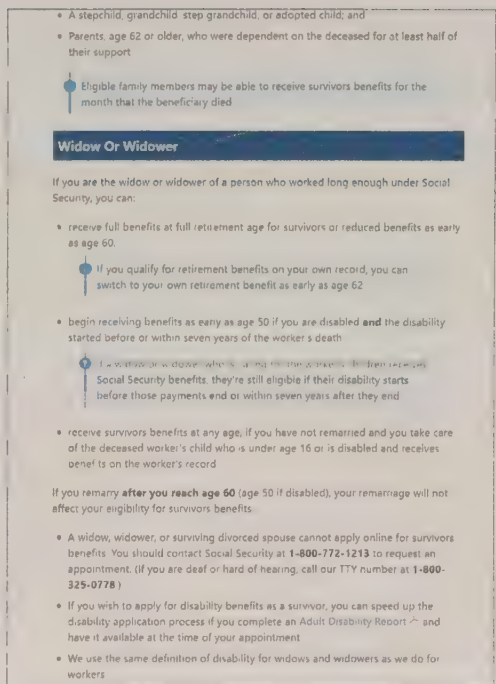


FIGURE 27.3 Scrolling even more, still on the same page

In fact, the reader needs to navigate through seven screens to finish the page. If the page had included progressive disclosure, then each topic could have been summarized in one or two sentences. The reader can then click or tap for more information. This is especially appropriate for the type of information on this page, because it is likely that only some of these sections apply to any one individual.

COUNTING CLICKS ISN'T WHAT COUNTS

Progressive disclosure requires multiple clicks. You may have heard it said that you should minimize the number of times that people have to click to get to detailed information. The number of clicks is not the important metric. People are very willing to click multiple times. In fact, they won't even notice they're clicking if they're getting the right amount of information at each click to keep them going down the path. Think progressive disclosure; don't count clicks.

KNOW WHO NEEDS WHAT WHEN

Progressive disclosure is a great technique, but it assumes that you know what most people want most of the time. If you haven't done your research on that, then you could

end up with a frustrating site, with most people having to spend a lot of time searching for the information they are looking for. Progressive disclosure works only if you know what most people will be looking for at each part of the path.



Read Krug's *Don't Make Me Think*

A great book about designing interfaces that don't require people to think too much is Steve Krug's *Don't Make Me Think*.



The origins of progressive disclosure

The term progressive disclosure was first used by J.M. Keller. Keller is a professor of instructional design, and in the early 1980s he came up with an instructional design model called Attention, Relevance, Confidence, and Satisfaction (ARCS). Progressive disclosure is part of the ARCS model: present only the information the learner needs at that moment.

Takeaways

- * Use progressive disclosure. Show people what they need when they need it. Build in links for them to get more information.
- * If you have to make a trade-off on clicks versus thinking, use more clicks and less thinking.
- * Before you use progressive disclosure, make sure you have done your research and know what most people want and when they want it.

SOME TYPES OF MENTAL PROCESSING ARE MORE CHALLENGING THAN OTHERS

Imagine you're paying bills on your banking website. You have to think about what bills need to be paid when, look up your balance, decide how much to pay on your credit cards, and click the right buttons to get the payments processed. As you do this task, there are things you're thinking about and remembering (cognitive), things you're looking at on the screen (visual), and buttons you are pressing, mouse movements, and typing (motor).

In human factors terminology, these are called *loads*. The theory is that there are basically three different kinds of demands or loads that you can make on a person: cognitive (including memory), visual, and motor.

ALL LOADS ARE NOT EQUAL

Each load uses up a different amount of mental resources. You use up more resources when you ask people to look at something or find something on a screen (visual) than when you ask them to press a button or move a mouse (motor). You use up more by asking them to think or remember or do a mental calculation (cognitive) than when you ask them to look at something on a screen (visual). So from a human factors point of view, the order of the loads from most "expensive" to least is:

- ★ Cognitive
- ★ Visual
- ★ Motor

MAKING TRADE-OFFS

From a human factors point of view, when you're designing a product, application, or website, you're always making trade-offs. If you have to add a few clicks but it means the person doesn't have to think or remember as much, that's worth it, because adding clicks is less of a load than thinking. I once did some research on this topic. People had to go through more than 10 clicks to get the task done, and at the end they would look up and smile and say, "That was easy!" because each step was logical and gave them what they expected. They didn't have to think. Clicking is less of a load than thinking.

USE FITTS'S LAW TO DETERMINE MOTOR LOADS

Although motor loads are the least “expensive” of the three loads, you often want to reduce them. One way to reduce the motor load is to make sure that the targets you’re asking people to hit aren’t too small or too far away—for example, when you ask them to move a mouse across a screen and click a button or a small arrow on a dropdown box to show a list of choices.

There is actually a formula that can be used to figure out how large a target should be to enable someone to reach it reliably while moving a mouse across the screen. It’s called Fitts’s law. The formula is shown in **Figure 28.1**.

$$T = a + b \log_2 \left(1 + \frac{D}{W} \right)$$

FIGURE 28.1 The formula for Fitts’s law

- ★ T is the average time taken to complete the movement (sometimes called MT for movement time).
- ★ a is the start/stop time of the device (intercept), and b stands for the inherent speed of the device (slope).
- ★ D is the distance from the starting point to the center of the target.
- ★ W is the width of the target measured along the axis of motion.

I don’t expect you to go calculate Fitts’s law, but I include it here so that you realize that there is a scientific way to determine how large a button or arrow should be.

The basic idea to keep in mind is that there is a relationship between speed, accuracy, and distance. For example, let’s say that you have a small arrow on the bottom right of the screen and the user has to move the mouse from the top left to the bottom right to click the small arrow. Fitts’s law tells us that they will probably overshoot the arrow if they move quickly, and they’ll have to back up and go to the arrow.



Minimize motor switching

One type of motor load is when people have to switch back and forth between a keyboard and a mouse or trackpad. This is especially true of people who are doing “heads down” data entry. If someone is typing or entering data from paper, and they do it a lot and are very skilled, chances are they are not looking at anything but the paper (hence the term “heads down”). In this case it can be distracting to move from keyboard to mouse. If possible, keep people on the keyboard or with the mouse as long as possible and minimize the switching.

SOMETIMES YOU WANT TO INCREASE LOADS

Most of the time when we consider loads in design, we're looking to reduce the loads (especially cognitive and visual) to make the product easier to use. But sometimes you want to increase the load. For example, to grab someone's attention you might add visual information (pictures, animation, video) and thereby increase the visual load of the product.

The best example of purposely increasing loads is gaming. A game is an interface in which one or more of the loads have been intentionally increased to provide a challenge. Some games have high cognitive loads because you have to figure out what's going on. Some have high visual loads, where you have to find things on the screen. Some have high motor loads, where you have to use the keyboard or a separate device to move the cursor or "shoot" the villains. Many games increase more than one load—for example, when a game has both visual and motor challenges.

do we know when to increase the load?

Takeaways

- * Evaluate the loads of an existing product to see if you should reduce one or more of the loads to make it easier to use.
- * When you design a product, remember that making people think or remember (cognitive load) requires the most mental resources.
- * Look for trade-offs (for example, where you can reduce a cognitive load by increasing a visual or motor load).
- * Make sure your motor targets are large enough to be easily reached.

You're at work reading a report that a colleague has written and you realize that you've just read the same sentence three times. Instead of thinking about what you were reading, your mind wandered.

Mind wandering is similar to but not the same as *daydreaming*. Psychologists use daydreaming to refer to any stray thoughts, fantasies, or stories you imagine—for example, winning the lottery or being a celebrity. *Mind wandering* is more specific: it refers to doing one task and then fading into thinking about something unrelated to that task.

MIND WANDERING IS A VERY COMMON PHENOMENON

People underestimate mind wandering; according to Jonathan Schooler of the University of California, Santa Barbara, people think their minds are wandering about 10 percent of the time—but it's actually much more than that. During everyday activities, our minds wander up to 30 percent of the time, and in some cases, such as driving on an uncrowded highway, it might be as much as 70 percent.



Wandering minds annoy neuroscientists

Some neuroscientists became interested in studying wandering minds because they were such an annoyance while doing brain scan research (Mason, 2007). The researchers would have subjects perform a certain task (for example, look at a picture or read a passage) while scanning for brain activity. About 30 percent of the time there would be extraneous results that seemed unrelated to the task at hand. That's because the subject's mind was wandering from the task at hand. Eventually researchers decided to start studying the wandering mind rather than just get annoyed by it.

WHY A WANDERING MIND CAN BE A GOOD THING

Mind wandering allows one part of the brain to focus on the task at hand, and another part of the brain to keep a higher goal in mind. For example, while driving you're paying attention to the road, but you're also thinking about when to stop for gas. Or you are reading an article online about a cholesterol medication that your doctor thinks you should take, but your mind wanders to the idea that you should put that haircut on your

calendar. Mind wandering might be the closest thing we have to multitasking. It's not really multitasking (see the "How People Focus Their Attention" chapter for more information on multitasking), but mind wandering does allow you to switch focus from one idea to another and then back again quickly.

WHY A WANDERING MIND CAN BE A BAD THING

Much of the time when your mind wanders, you're unaware of it. This means that you can miss important information. For example, if you are supposed to be reading that report from your colleague but you are instead thinking about what to make for dinner, that may just mean you are being unproductive.



When mind wanders, people miss details

Researchers at the University of California, Santa Barbara (Christoff, 2009), have evidence that people whose minds wander a lot are more creative and better problem solvers. Their brains have them working on the task at hand but simultaneously processing other information and making connections.

Takeaways

- * People will focus on a task for only a limited time. Assume that their minds are wandering often.
- * If possible, use hyperlinks to grab onto this idea of quickly switching from topic to topic. People like having more link options because it enables this type of wandering.
- * Make sure you build in feedback about where people are so that if they wander, it's easier for them to get back to the original location or go to the next.

THE MORE UNCERTAIN PEOPLE ARE, THE MORE THEY DEFEND THEIR IDEAS

Several years ago I was a loyal iPhone user. I wasn't always an Apple fan; I used to be a Windows/PC person. Realize that I go all the way back to when PCs first came out. I used to have a marvelous "portable" PC that ran on a CPM operating system and had two (count 'em, *two*) 360 KB (yes, I said KB) floppy disk drives (in other words, *no* hard drive). I was a PC person, *not* an Apple person. Apples were for teachers and then later for artsy people. That was not me.

But I became an Apple convert over a few years in the early 2000s. (I describe the story of how I changed my loyalty from PCs to Apple in my book *Neuro Web Design: What Makes Them Click?* It's a matter of starting with small changes and commitments and then growing to more loyalty.)

Perhaps you might be able to guess what happened when I went to dinner with a colleague who was showing me his Android phone. He loved his new Android phone and wanted to show me all the ways it was as good as, or better than, my iPhone. I was totally uninterested in hearing about it. I didn't even want to look at it. Basically, I didn't want to allow into my brain any information that would conflict with my opinion that nothing besides an iPhone was even a possibility. I was showing classic symptoms of *cognitive dissonance denial*. (As of this writing I have to report that I did eventually switch to Android, and even back to Windows/PC, but that's another story!)

ALTER OUR BELIEFS OR DENY THE INFORMATION?

In 1956 Leon Festinger wrote a book called *When Prophecy Fails*. In it he describes the idea of cognitive dissonance. Cognitive dissonance is the uncomfortable feeling you get when you have two ideas that conflict with each other. You don't like the feeling, so you'll try to get rid of the dissonance. There are two main ways you can do that: change your belief or deny one of the ideas.

When forced, people will change their beliefs

In the original research on cognitive dissonance, people were forced to defend an opinion that they did not believe in. The result was that people tended to change their beliefs to fit the new idea.

In research by Vincent Van Veen (2009), he had people "argue" that the fMRI scan experience was pleasant (it's not). When "forced" to make statements that the experience was pleasant, certain parts of the brain showed as active (the dorsal anterior cingulate

cortex and the anterior insular cortex). The more these regions were activated, the more the participant would claim that he or she really did think the fMRI was pleasant.

When not forced, people dig in

There's another reaction that sometimes occurs. What if you are not forced to state that you believe something you don't; what if instead you are presented with information that opposes your beliefs, but you are not forced to espouse a new belief? In these situations the tendency is to deny the new information instead of changing your belief to fit.

If uncertain, people will argue harder

David Gal and Derek Rucker (2010) conducted research in which they used framing techniques to make people feel uncertain. (For example, they told one group to remember a time when they were full of certainty, and the other group to remember a time when they were full of doubt.) Then they asked the participants whether they were meat-eaters, vegetarians, vegans, or otherwise, how important this was to them, and how confident they were in their opinions. People who were asked to remember a time of uncertainty were less confident of their eating choices. However, when asked to write up their beliefs to persuade someone else to eat the way they did, they would write more and stronger arguments than those who were certain of their choice. Gal and Rucker performed the research with different topics (for example, preferences for a Mac versus a PC computer) and found similar results. When people were less certain, they would dig in and argue even harder.

ASK FOR SMALL COMMITMENTS * do we do this while onboarding?

Let's say that you have designed a landing page hoping that visitors will purchase your product or service. The problem is you may not know whether people coming to the page are ready to buy or whether they are uncertain or perhaps even downright skeptical.

The best tactic to use, therefore, might be to ask for a small commitment rather than a large one. This is why free trials work so well. It's a small commitment to sign up for a seven-day free trial and will therefore make it less likely for someone to have a strong reaction and dig in their heels against your product or service.

Takeaways

- * The best way to change a belief is to get someone to commit to something very small.
- * Don't just give people evidence that their belief is not logical, tenable, or a good choice. This may backfire and make them dig in even harder.

Imagine that you've never seen a Kindle, but I've just handed you one and told you that you can read books on it. Before you turn on the Kindle, before you use it, you have a model in your head of what reading a book on the device will be like. You have assumptions about what the book will look like on the screen, what things you will be able to do, and how you will do them—things like turning a page or using a bookmark. You have a *mental model* of reading a book on the Kindle, even if you've never done it before.

What that mental model in your head looks and acts like depends on many things. If you've used an electronic device to read a book before, your mental model of reading a book on a Kindle will be different from that of someone who has only read physical books. And once you get the Kindle and read a couple of books on it, whichever mental model you had in your head before will start to change and adjust to reflect your experience.

I've been talking about mental models (and their counterparts, conceptual models, discussed in the following section) since the 1980s. I've been designing interfaces for software, websites, medical devices, and various products for many years. I always enjoy the challenge of matching what's going on in people's brains with the constraints and opportunities presented by technology. Interface environments come and go (for example, the green screen of character-based systems, or the blue screen of early graphical user interfaces), but people change more slowly. Some of the age-old user interface design concepts are still extremely relevant and important. Mental models and conceptual models are some of the most useful design concepts that I believe have passed the test of time.



The origin of the term *mental models*

The first person to talk about mental models was Kenneth Craik in his 1943 book, *The Nature of Explanation*. Shortly thereafter, Craik died in a bicycle accident, and the concept went dormant for many years. It reappeared in the 1980s, when two books were published with the title *Mental Models*, one by Philip Johnson-Laird and the other by Dedre Gentner.

WHAT EXACTLY IS A MENTAL MODEL?

A mental model is a collection of thought processes and memories about how something works. Mental models drive behavior. They direct us to pay attention to some things and ignore others, and they influence how we solve problems.

In the field of design, a mental model refers to the representation of something—the real world, a device, software, and so on—that a person has in mind. People create mental models very quickly, often before they even use the software or device. Their mental models come from their prior experience with similar software or devices, assumptions they have, things they've heard others say, and also their direct experience with the product or device. Mental models are subject to change. People refer to mental models to predict what the system, software, or product is going to do, or what they should do with it.

Takeaways

- * People always have a mental model.
- * People get their mental models from past experience.
- * Not everyone has the same mental model.
- * An important reason for doing user or customer research is so you can understand the mental models of your target audience

To understand why mental models are so important to design, you also have to understand what a conceptual model is and how it differs from a mental model. A mental model is the representation that people have about a product they are interacting with. A conceptual model is the actual model that is given to the person through the design and interface of the actual product. Going back to the Kindle example, you have a mental model of what reading a book will be like using a Kindle, how it will work, and what you can do with it. But when you sit down with the Kindle, the “system” (the Kindle) displays what the conceptual model of that book app actually is. There will be screens and buttons and things that happen. The actual interface is the conceptual model. Someone designed an interface, and that interface is communicating to you the conceptual model of the product.

At this point you might be asking, “So? Why should I care about this mental model/conceptual model idea?” Here’s why you should care: if there is a mismatch between the person’s mental model and the product’s conceptual model, then the product or website or app will be hard to learn, hard to use, or rejected. How do mismatches occur? Here are some examples:

- Important*
- ★ The designers thought they knew who would be using the interface and how much experience they had with interfaces like this, and they designed according to those assumptions without testing them. It turns out their assumptions were wrong.
 - ★ The audience or the product is varied. The designers designed for one persona or type of audience, and the mental model and conceptual model match for that group but not for others.
 - ★ There are no real designers. The conceptual model wasn’t really designed at all. It’s just a reflection of the underlying hardware or software or database, so the only people whose mental model it fits are the programmers. If the audience is not the programmers, then you’re in trouble.

WHAT IF IT’S BRAND NEW AND I PURPOSELY WANT A MISMATCH?

What about the idea that people who have only read real, physical books will not have an accurate mental model of reading books on a Kindle? In this case you know that people will not have an accurate mental model that fits. You want to change their mental model.

Sometimes you know that the mental model of the target audience will not fit the conceptual model, and instead of changing the design of the interface, you want to change people's mental model to match the conceptual model you've designed. The way to change a mental model is through training. You can use a short training video to change their mental model before the Kindle even arrives at their door. In fact, one of the best purposes of training on a new product is to adjust the audience's mental model to fit the conceptual model of the product.

Takeaways

- * Design the conceptual model purposefully. Don't let it "bubble up" from the technology.
- * The secret to designing an intuitive user experience is making sure that the conceptual model of your product matches, as much as possible, the mental model of your audience. If you get that right, you will have created a positive and useful experience.
- * If you have a brand new product that you know will not match anyone's mental model, you'll need to provide training to prepare people to create a new mental model.

One day, many years ago, I found myself in front of a classroom full of user interface designers who did not want to be there. Their boss had told them they had to attend the workshop I was giving. I knew that many or most of them thought the class was a waste of time, and knowing that was making me nervous. I decided to be brave and forge ahead. Certainly my great content would grab their attention, right? I took a deep breath, smiled, and with a strong voice, I started the session with a big, “Hello, everyone. I’m certainly glad to be here.” More than half the class wasn’t even looking at me. They were reading their email. One guy had the morning newspaper open and was reading that. It was one of those moments where seconds seem like hours.

I thought to myself in a panic, “What am I going to do?” Then I had an idea. “Let me tell you a story,” I said. At the word story everyone’s head jerked up and all eyes were on me. I knew I only had a few seconds to start a story that would hold their attention.

“It was 1988 and a team of Navy officers were staring at a computer screen. Something had just appeared on the radar in protected air space. They had orders to shoot down any unknown aircraft. Was this an unknown aircraft? Was it a military plane? Was it a commercial airliner? They had two minutes to decide what to do.” I had them! Everyone was interested and riveted. I finished the story, which nicely made my point about why they should care about designing usable interfaces that avoid user uncertainty, and we were off to a great start. The rest of the day flew by, everyone was interested and engaged, and I got some of my best teacher evaluations ever. Now I make sure to use that magic phrase, “Let me tell you a story,” at least once in every talk I give or class I teach.

You may have realized that what I did in the previous paragraph was tell a story. Stories are very powerful. They grab and hold attention. But they do more than that. They also help people process information, and they imply causation.

TRIED-AND-TRUE STORY FORMATS

Aristotle identified the basic structure of stories, and many people have expounded on his ideas since. One model is the basic three-act structure: beginning, middle, and end. This may not sound very unusual, but when Aristotle came up with it over two thousand years ago it was probably pretty radical.

In the beginning you introduce your audience to the setting, the characters, and the situation or conflict. In the previous story I introduced you to the setting (I had to give a class), the characters (me and students), and the conflict (the students don’t want to be there).

My story was very short, so the middle part was short too. In the middle part of a story, there are typically obstacles and conflicts that the main character has to overcome. These are usually somewhat resolved, but not completely resolved. In my story the main character tried her usual opening and it failed. Then she started to panic.

At the end of the story the conflict comes to a climax and then is resolved. In my story I thought of what to do (tell a story to the class), which I did and which succeeded.

This is just a basic outline. There are many variations and plots that can be added and woven in.

CLASSIC STORIES

There are many stories that appear over and over in literature and in movies. Here are some of the popular themes that have been identified:

- | | |
|-----------------------|-------------|
| ★ The Great Journey | ★ Love |
| ★ Coming of Age | ★ Fate |
| ★ The Sacrifice | ★ Revenge |
| ★ The Epic Battle | ★ The Trick |
| ★ The Fall from Grace | ★ Mystery |

STORIES IMPLY CAUSATION

Stories may create causation when none is there. Because stories usually involve some form of chronological narrative (first this happened, next this happened), they imply causation even if none exists. Christopher Chabris and Daniel Simons give this example in their book *The Invisible Gorilla* (2010). Look at these two passages:

Joey's big brother punched him again and again. The next day his body was covered by bruises.

Joey's crazy mother became furiously angry with him. The next day his body was covered by bruises.

In the first passage you don't need to assume much. Joey got punched, and he has bruises. He got the bruises from being punched. In the second passage the inference is not quite so clear. Research shows that your brain will actually take a little bit longer to ponder the second paragraph. Yet most people will conclude that Joey has bruises because of his mother, even though the passage doesn't say that. In fact, if you ask people later to remember the passage, they will believe that they read in the story that Joey's mother actually hit him, even though that is not what the paragraph says.

People are quick to assign causality. Just as the visual cortex is filling in what you see to find and detect patterns (see the “How People See” chapter), our thought processes do the same thing. You are always looking for causation. Your brain assumes you have been given all the pertinent information and that there is causation. Stories make it even easier to make this causal leap.

STORIES ARE IMPORTANT IN ALL COMMUNICATIONS

Sometimes clients say to me, “Stories are fine for some situations, but not the one I’m working on now. I’m designing a website for the company’s annual report. Stories aren’t appropriate there; it’s just financial information.” Not true. There are appropriate stories you can use anytime you are trying to communicate.

A medical technology company I worked with uses stories in their annual reports. For example, on the cover of one of the annual reports they showed a photo of a patient who was helped by one of their products. Later in the report there was a short story about the patient (we’ll call her Maureen):

“Maureen Showalter, shown here and on the cover, had such a severe lumbar scoliosis that the pain incapacitated her, and the deformity was progressively getting worse. Then she underwent spinal fusion surgery using our spinal products to correct the alignment. Today, Maureen’s spine is much straighter, her pain is virtually gone, and she is several inches taller.”

Maureen’s was not the only story in the annual report. Sprinkled in with the financial information were high-quality photos as well as stories about people like Maureen and about employees who invented various technologies. The stories make the rest of the information in the report more interesting and also create a link between the financial numbers and the stated mission of the company.

Takeaways

- * Stories are the natural way people process information.
- * Use a story if you want people to make a causal leap.
- * Stories aren’t just for fun. No matter how dry you think your information is or should be, using stories will make it understandable, interesting, and memorable.

Let's say you're a marketing person and you want to email your customers about a new product offering. You bring up a web page that has directions on how to build an email campaign using the email software service your company has subscribed to:

1. From the Dashboard or the Campaign tab click the "Create Campaign" button and select the type of campaign you'd like to create.
2. Next select the list you'd like to send to. Once you've selected the list, use the "next" option to move forward, or click "send to entire list."
3. Next name your campaign, set up a subject line, set the from name reply-to email, and personalize your "To:" field with *!MERGETAGS!*. You will also find your options for tracking, authentication, analytics tracking, and social sharing. (Use the "next" and "back" options to navigate through the steps [not your browser's back button].)
4. Select a template for your email. Templates you've set up and saved are in "my templates." If you're providing your own code, use the "paste/import HTML" or "import from URL" options. If you want to create an editable (or non-editable) template for your clients, choose "code custom templates."
5. Once you choose your template you next use the content editor to edit your styles and content. Click "show style editor" to bring up the style options.
6. You can edit the styles for each section. You can set the line height, font size, and more for this section.
7. Click anywhere inside the borders to open the content editor.
8. After you click Save, wait for your content to refresh; then click the "next" option.
9. Send some test emails to several email addresses to see how the campaign looks in your recipient's inboxes. If everything looks good, you can schedule or send out your campaign.

Long and difficult to understand, right? Luckily this is *not* how the information is actually presented. The text is the same, but it is combined with screen shots to show an example of what the text is talking about.

Screen shots or pictures are a good way to provide examples. You can also use videos that walk you through the same steps. Video is one of the most effective ways to give examples online. Videos combine movement, sound, and vision, and don't require reading, so they are attention-getting and engaging.

Takeaways

- * People learn best by example. Don't just tell people what to do. Show them.
- * Use pictures and screen shots to show by example.
- * Better yet, use short videos as examples.

If you grew up with TV in the U.S. in the last 50 years, you probably know what I mean if I say, “One of these things is not like the other.” This is a snippet from the popular children’s show *Sesame Street*.



Watch the video clip.

If you don’t know what I am talking about, you can view YouTube clips. Here’s an example: www.youtube.com/watch?v=_Sgk-ZYxKxM.

The purpose of this *Sesame Street* lesson is to teach young children how to notice differences and essentially how to start to learn to categorize.

Interestingly, it’s probably unnecessary, and perhaps even ineffective, to try to teach children how to create categories, for two reasons:

- ★ People naturally create categories. Just as learning a native language happens naturally, so does learning to categorize the world around us.
- ★ Categorizing doesn’t emerge as a skill until about age seven. Thinking about categories just doesn’t make sense to children before that. After age seven, however, kids become fascinated with categorizing information.

PEOPLE LOVE TO CATEGORIZE

If you’ve ever conducted a card-sorting exercise while doing research for a product design, then you’ve had the experience of watching how avidly people approach the task. In card sorting, you typically give people a stack of cards. On each card is a word or phrase about something they would find at the website or a task they might do with the product you are designing. For example, if you’re designing a website that sells camping equipment, then you might have a set of cards that say things like tents, stoves, backpack, returns, shipping, help. You ask the people to arrange the cards into whatever groups or categories make sense to them. Then you analyze the groupings and have data from which to build the organization of your website. I’ve done this many times, including using it as an exercise in classes I teach. It’s one of the most engaging tasks I have people do. Everyone gets very involved in this exercise, because people

like to create categories. The whole field of information architecture is about how to organize information into categories.

IF YOU DON'T PROVIDE CATEGORIES, PEOPLE WILL CREATE THEIR OWN

Just as the visual cortex imposes patterns on what we see, whether or not there are really patterns there (see the “How People See” chapter), people will impose categories when they’re confronted with large amounts of information. People use categorization as a way to make sense of the world around them, especially when they feel overwhelmed with information.

WHO ORGANIZES IT DOESN'T MATTER AS MUCH AS HOW WELL IT'S ORGANIZED

While working on my master's thesis at Penn State, I conducted research on whether people would remember information better if it was organized by other people or if they organized it themselves. Basically what I found was that it didn't really matter. What mattered most was how *well* it was organized. The more organized the information, the better people remembered it. Some people (those who measured high on “locus of control” measures) preferred to organize the information in their own way, but self-organization versus other organization schemes didn't really matter as long as the information was well organized.

Takeaways

- * People like to put things into categories.
- * If there is a lot of information and it is not in categories, people will feel overwhelmed and try to organize the information on their own.
- * It's always a good idea to organize information for your audience as much as possible. Keep in mind the four-item rule from the “How People Remember” chapter.
- * It's useful to get input from people on what organization schemes make the most sense to them, but the critical thing is that you organize the material.
- * If you're designing sites for children under age seven, any organization into categories you are doing is probably more for the adults in that child's world, not for the child.

Has this ever happened to you? You're traveling to visit friends. It's two hours to get there and two hours to get back, but the trip there feels much longer than the trip back.

In the interesting book *The Time Paradox* (2009), Philip Zimbardo and John Boyd discuss how our experience of time is relative, not absolute. There are time illusions, just like there are visual illusions. Zimbardo reports on research that shows that the more mental processing you do, the more time you think has elapsed. Related to the concept of progressive disclosure, discussed earlier in this chapter, if people have to stop and think at each step of a task, they'll feel that the task is taking too long. The mental processing makes the amount of time seem longer.

The perception of time and your reaction to it are also greatly influenced by predictability and expectations. Let's say you're editing video on your computer. You've just clicked the button to produce the video file from your edits. Will you be frustrated by how long it takes to produce the video? If you do this task often and it normally takes three minutes, then three minutes will not seem like a long time. If there is a progress indicator, then you know what to expect. You'll go pour yourself a cup of coffee and come back. But if it sometimes takes thirty seconds and sometimes takes five minutes, and you don't know which one it's going to be this time, then you will be very frustrated if it takes three minutes. Three minutes will seem much longer than it usually does.

IF PEOPLE FEEL PRESSED FOR TIME, THEY WON'T STOP TO HELP SOMEONE

In the "Good Samaritan" research by John Darley and C. Batson (1973), Princeton seminary students were asked to prepare a speech on either jobs for seminary graduates or the parable of the Good Samaritan. The parable is about several holy men who pass someone in need but don't stop to help. The Samaritan comes upon the person in need and does stop and help him. In the research study, the seminary students were asked to prepare their talks, and then they were told to go to a building across campus and give the talk. The experimenter gave the participants different instructions, depending on whether they were in the low hurry, intermediate hurry, or high hurry category:

- ★ **Low hurry:** "It'll be a few minutes before they're ready for you, but you might as well head on over. If you have to wait over there, it shouldn't be long."
- ★ **Intermediate hurry:** "The assistant is ready for you, so please go right over."
- ★ **High hurry:** "Oh, you're late. They were expecting you a few minutes ago. You'd better get moving. The assistant should be waiting for you so you'd better hurry. It should only take a minute."

Each student was then given an index card with instructions about where to go. The instructions took them past someone who was part of the experiment, and this person was huddled and coughing and groaning in an alley on campus. The question was, how many people would stop and offer help? Would it matter what talk they had been preparing to give? Would it matter what instructions they were given on whether to hurry or not?

What percentage of people stopped to help?

- ★ **Low hurry:** 63 percent
- ★ **Intermediate hurry:** 45 percent
- ★ **High hurry:** 10 percent

The type of talk the participants had prepared for (jobs versus the Good Samaritan parable) didn't make a significant difference in whether they stopped to help, but how much of a hurry they were in did.

EXPECTATIONS CHANGE OVER TIME

Ten years ago if it took twenty seconds for a website to load, we didn't think much of it. But these days if it takes more than three seconds, you get impatient. One website I go to regularly takes twelve seconds to load. It seems like an eternity.



Time mechanisms in your body

Rao (2001) used fMRI images of the brain to show that two areas process information about time: the basal ganglia (deep inside the brain where dopamine is stored) and the parietal lobe (on the surface of the right side of the brain). Some time functions are also built into each cell of the body.

Takeaways

- ✱ Always provide progress indicators so people know how long something will take.
- ✱ If possible, make consistent the amount of time it takes to do a task or bring up information so that people can adjust their expectations accordingly.
- ✱ To make a process seem shorter, break it up into steps and have people think less. It's mental processing that makes something seem to take a long time.

Have you ever met someone who has a long-held belief that they just won't change, no matter how much evidence you show them that the belief is not tenable? People seek out and pay attention to information and cues that confirm their beliefs. They don't seek out—in fact, they ignore or even discount—information that doesn't support what they already believe. This is called confirmation bias.

A confirmation bias is a type of “cognitive illusion.” People tend to pay attention to what they already believe and filter out information that doesn't fit with their opinions and beliefs.

This can make it difficult to get someone to be willing to even read or listen to information that doesn't fit what they already believe, much less to try out something new.

Is it possible to “get through” to people with information that may not fit their existing biases? If you have a new idea, a new product, or a different way of doing a process, how do you get people to even consider it?

One way is to start with something that they agree with. If you first provide information that they already believe, you have gotten through the first barrier. Don't start with the new idea; start by confirming an idea they already have.

For example, let's say that you want people to consider a new way to purchase and listen to music. If you are talking to an audience that loves the method they are using now (perhaps they subscribe to a streaming service), don't begin by telling them how inferior their current streaming service is. Start by mentioning all the ways their current service is great. They will nod along, and then you can start to talk about why they can go to the next level with your product.

Another way to get past a confirmation bias is to get a small commitment to a new belief and thereby cause cognitive dissonance, which we discussed in a different part of this chapter.

So in the music-streaming example, you could see if you can get people to sign up for a short trial for free. That is a small commitment. If they find out they enjoy the service, now they have cognitive dissonance: they enjoy the service, but the service doesn't fit their beliefs about the best way to listen to music. With that crack in the belief, they are more likely to let the confirmation bias go.

Takeaways

- * Most people operate with confirmation biases. They filter out information that doesn't agree with beliefs they already hold.
- * Telling people they are wrong, or pointing out the fact that they are doing the filtering, is usually not a great strategy for overcoming cognitive biases.
- * If you know your target audience and you know what their beliefs are, you can start by speaking to those beliefs rather than against them. This allows you to get past a first layer of confirmation bias, and then you can start to point out a different or better way that might go against a current belief.
- * Try to get a small commitment to an action that goes against the confirming belief. This will stimulate cognitive dissonance and then you have a chance to break down the cognitive bias.

Imagine you're engrossed in some activity. It could be something physical like rock climbing or skiing, something artistic or creative like playing the piano or painting, or just an everyday activity like working on a PowerPoint presentation or teaching a class. Whatever the activity, you become totally engrossed, totally in the moment. Everything else falls away, your sense of time changes, and you almost forget who you are and where you are. What I'm describing is called a *flow state*.

The man who wrote the book on flow is Mihaly Csikszentmihalyi. He's been studying the flow state around the world for many years. Here are some facts about the flow state, the conditions that produce it, what it feels like, and how to apply the concept to your designs:

- ★ The flow state occurs when people have very focused attention on a task. The ability to control and focus attention is critical. If people get distracted by anything outside the activity they're engaging in, the flow state will dissipate. If you want people to be in a flow state while using your product, minimize distractions when they are doing a particular task.
- ★ People reach flow by working with a specific, clear, and achievable goal in mind. Whether they are singing, fixing a bike, or running a marathon, the flow state comes about when people have a specific goal. They then keep that focused attention and only let in sensory information that fits with the goal.
- ★ People need to feel that they have a good chance of completing the goal to get into, and hold onto, the flow state. If they think they have a good chance of failing at the goal, then the flow state will not be induced. And, conversely, if the activity is not challenging enough, then they won't hold their attention on it and the flow state will end. Make sure to build in enough challenge to hold attention, but don't make the tasks so hard that people get discouraged.
- ★ People need constant feedback. To stay in the flow state, they need a constant stream of information that gives them feedback as to the achievement of the goal. Make sure you are building in lots of feedback messages as people perform the tasks.
- ★ People need to feel they have control over their actions. Control is an important condition of the flow state. They don't necessarily have to be in control or feel that they are in control of the entire situation, but they do have to feel that they're exercising significant control over their own actions in a challenging situation. Give people control at various points along the way.

- ★ Some people report that time speeds up—they look up and hours have gone by. Others report that time slows down.
- ★ To hold on to a flow state people need to feel that the “self” is not threatened. They have to be relaxed enough to engage all of their attention on the task at hand. In fact, most people report that they lose their sense of self when they are absorbed with the task.
- ★ The flow state is personal. Everyone has different activities that put them in a flow state. What triggers a flow state for one person might be different from what triggers it for others.
- ★ The flow state crosses cultures. So far it seems to be a common human experience across all cultures, with the exception of people with some mental illnesses. People who have schizophrenia, for example, have a hard time inducing or staying in a flow state, probably because they have a hard time with some of the other items mentioned, such as focused attention, control, or the self not feeling threatened.
- ★ The flow state is pleasurable. People like being in the flow state.
- ★ The prefrontal cortex and basal ganglia are both involved in getting into and maintaining a flow state.

Takeaways

- ★ If you're trying to design for, or induce, a flow state (for example, you are a game designer):
 - ★ Give people control over their actions during the activity.
 - ★ Pick the right amount of challenge—too much challenge and people will give up. Not enough and the flow state won't start.
 - ★ Give constant feedback. Feedback is not the same thing as praise (“You're doing a great job!”). Feedback is information so the person can tell exactly how they are doing and what they might need to change in order to reach a goal.
 - ★ Minimize distractions.

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CULTURE AFFECTS HOW PEOPLE THINK

Take a look at **Figure 39.1**. What do you notice more, the cows or the backgrounds?



FIGURE 39.1 Picture used in Hannah Chua (2005) research

The way you answer might depend on where you grew up—the West (U.S., U.K., Europe) or East Asia. In his book *The Geography of Thought*, Richard Nisbett discusses research that shows that how we think is influenced and shaped by culture.

EAST = RELATIONSHIPS; WEST = INDIVIDUALISTIC

If you show people from the West a picture, they focus on a main or dominant foreground object, while people from East Asia pay more attention to context and background. East Asian people who grow up in the West show the Western pattern, not the Asian pattern, thereby implying that it's culture, not genetics, that accounts for the differences.

The theory is that in East Asia, cultural norms emphasize relationships and groups. East Asians, therefore, grow up learning to pay more attention to context. Western society is more individualistic, so Westerners grow up learning to pay attention to focal objects.

Hannah Chua et al. (2005) and Lu Zihui (2008) used the pictures in **Figure 39.1** and eye tracking to measure eye movement. They both showed that the East Asian participants spent more time with central vision on the backgrounds and the Western participants spent more time with central vision on the foreground.

CULTURAL DIFFERENCES SHOW UP IN BRAIN SCANS

Sharon Begley (2010) wrote an article in Newsweek on neuroscience research that also confirms the cultural effects:

“When shown complex, busy scenes, Asian-Americans and non-Asian-Americans recruited different brain regions. The Asians showed more activity in areas that process figure-ground relations—holistic context—while the Americans showed more activity in regions that recognize objects.”



Concerns about generalizing research?

If Western and Eastern people think differently, then do we have to wonder how much we can generalize psychology (or other) research results from one group to another? It's been common practice to use research subjects from only one geographical region. Now you have to wonder about the accuracy of some of this research. Does it describe only the people in that area? Fortunately there is more and more research coming out of various parts of the world, and more individual studies being conducted in multiple locations. Psychological research now is less focused on one region or group than it was in the past.

Takeaways

- * People from different geographical regions and cultures respond differently to photos and website designs. In East Asia people notice and remember the background and context more than people in the West do.
- * If you are designing products for multiple cultures and geographical regions, then you had better conduct audience research in multiple locations.
- * When reading psychology research, you might want to avoid generalizing the results if you know that the study participants were all from one geographical region.

HOW PEOPLE FOCUS THEIR ATTENTION

What makes us sit up and take notice? How do you grab and hold someone's attention? How do we choose what to notice and what to pay attention to?

Robert Solso (2005) developed this exercise: in the following paragraph, read only the words that are bold, and ignore all the other text.

*Somewhere **Among** hidden on a **the** desert island **most** near the **spectacular** **X** islands, an **cognitive** old **Survivor** **abilities** contestant **is** has **the** concealed **ability** a box **to** of gold **select** won **one** in a **message** reward **from** challenge **another**. **We** Although **do** several hundred **this** people **by** (fans, **focusing** contestants, **our** and producers) have **attention** looked **on** for it **certain** they **cues** have **such** not **as** found **type** it **style**. **Rumor** **When** has **we** it **focus** that 300 **our** paces **attention** due **on** west **certain** from **stimuli** tribal **the** council **message** and **in** then **other** 200 **stimuli** paces **is** due **not** north **X** marks **clearly** the spot **identified**. Apparently **However** enough **some** gold **information** can **from** be **the** had **unattended** to **source** purchase **may** the **be** very **detected** island!*

People are easily distracted in many situations. In fact, their attention can often be pulled away from what they're focusing on. But they can also pay attention to one thing and filter out all other stimuli. This is called selective attention.

How difficult it is to grab their attention depends on how engrossed or involved they are. For example, if they come to your website to shop for a gift and aren't sure what to get, it will be fairly easy to grab their attention with video, a large photo, color, or animation.

On the other hand, if someone is concentrating on a particular task, such as completing a complicated form, they're probably filtering out distractions.

We've all had the experience of having a popup window show up on a screen asking us to subscribe or sign up when we were engrossed in reading an article. The more engrossed we are, the more annoying that experience is.

UNCONSCIOUS SELECTIVE ATTENTION

Imagine you're walking down a path in the woods and thinking about an upcoming business trip when you see a snake on the ground. You jump backward. Your heart races. You're ready to run. But wait—it's not a snake; it's just a stick. You calm down and keep walking. You noticed the stick, and even responded to it, in a largely unconscious way.

Sometimes you're aware of your conscious selective attention, like when you were reading the paragraph at the beginning of this chapter. But selective attention also operates unconsciously.



Imagine you're at a cocktail party. You're talking to the person next to you. It's noisy, but you can screen out the other conversations. Then you hear someone say your name. Your name cuts through your filter and quickly comes to your attention—an example of your selective attention at work.

Takeaways

- * People are capable of focusing their attention on one thing and ignoring everything else when they want to or when they have to in order to complete a difficult task.
- * Don't assume, however, that people are always paying close selective attention.
- * Our unconscious minds constantly scan the environment for certain things. These include our own name as well as messages about food, sex, and danger. This means that people are easily distracted by large images, animation, and video.

In 1988 the U.S. Navy had a ship in the Persian Gulf called the USS *Vincennes*. One day, while scanning the radar screen on the ship, the crew saw an aircraft headed their way. They decided that the approaching aircraft was not a commercial airliner, but a hostile military plane. They shot down the plane, which did turn out to be a commercial airliner with 290 passengers and crew onboard. Everyone died.

Many factors led to this erroneous conclusion. The situation was stressful (I'll cover stress in the chapter "People Make Mistakes"), and the room was too dark. There were many ambiguous pieces of information that made it hard for the *Vincennes* crew to understand what they were looking at on their radar screen. Most significant, however, is what they chose to pay attention to and what they chose to ignore.

The crew was used to scanning for hostile military planes. They were "habituated" to see planes on the radar as military planes, not commercial jets. They had repeatedly rehearsed the training scenario on what to do when a hostile military plane entered their air space. They therefore proceeded to carry out the training scenario. All of this led them to an incorrect conclusion.

Takeaways

- ✧ Don't expect that people will necessarily pay attention to information you provide, especially if they have habituated to certain information and certain actions.
- ✧ Don't make assumptions. What is obvious to you as the designer may not be obvious to the people using what you've designed.
- ✧ If you think people might be habituating and not noticing that information has changed, then use color, size, animation, video, or sound to draw attention to what's different.
- ✧ If it's critical that people pay attention to certain information, make that information stand out 10 times more than you think is necessary.

WELL-PRACTICED SKILLS DON'T REQUIRE CONSCIOUS ATTENTION

When my children were growing up, they took music lessons using the Suzuki method. My son studied violin, and my daughter studied piano. After attending one of my daughter's recitals, I asked her what she was thinking about while she was performing the piano sonata from memory, with no music in front of her. The dynamics of the music? When to get louder or softer? Particular notes or passages that were coming up?

She looked at me in confusion.

"Thinking?" she said. "I'm not thinking about anything. I'm just watching my fingers play the song."

It was my turn to be confused.

I turned to my son and asked, "Is that how you play the violin in a recital? Are you thinking?"

"No, of course I'm not thinking," he answered. "I'm watching my fingers play the violin."

The Suzuki method stresses constant repetition. Students don't have music in front of them during recitals; instead, they memorize all the pieces, many of them quite complicated. They practice their music so often that they learn how to play it without even thinking.

If a skill is practiced so much that it becomes automatic, then it can be performed with a minimum of conscious attention. If it's truly automatic, then it almost allows multitasking. I say *almost* because multitasking doesn't exist the way most people think it does.

TOO MANY AUTOMATIC STEPS CAN LEAD TO ERRORS

Have you ever used a software application that requires you to go through a series of steps to delete an item? You have to click the item, then click the Delete button, and then a window pops up and you have to click the Yes button to confirm. You need to delete about 25 files, so you position your fingers in an optimal way and start clicking. Before too long your fingers have taken over, and you aren't even thinking about what you're doing. In this type of situation it's easy to accidentally keep deleting past where you were supposed to stop.

Takeaways

- * If people perform a series of steps over and over again, the action will become automatic.
- * If you require people to perform a sequence repeatedly, make it easy to do, but realize that the trade-off is that people may make errors because they are no longer paying attention.
- * Make it easy for people to undo not only their last action but also an entire sequence.
- * Rather than requiring people to perform a task over and over, consider a design where they can choose all the items they want to take action on and then perform the action on all the items at once.

Farid Seif, a businessman from Houston, Texas, boarded a flight in Houston with a loaded handgun in his laptop case. He made it through security without a problem. Seif was not a terrorist. The gun was legal in Texas; he simply forgot to take it out of his laptop case before his trip.

Security at the Houston airport did not detect the gun. It should have been easily seen by security personnel looking at the X-ray scanner, but no one noticed it.

The U.S. Department of Homeland Security routinely tests the ability to pass security screening with guns, bomb parts, and other forbidden items by sending them through with undercover agents. The U.S. government won't release the figures officially, but the estimate is that 70 percent of these tests fail, meaning most of the time the agents are able to get through security, like Farid Seif, with objects that are supposed to be spotted.

Why does this happen? Why do security personnel notice the bottle of lotion that is too large but miss a loaded handgun?



▶ <http://abcnews.go.com/Blotter/loaded-gun-slips-past-tsa-screeners/story?id=12412458>

You can see an ABC News video on this topic at <http://abcnews.go.com/Blotter/loaded-gun-slips-past-tsa-screeners/story?id=12412458>.

A MENTAL MODEL ABOUT FREQUENCY

Security personnel miss the loaded handgun and bomb parts at least in part because they don't encounter them frequently. A security officer is working for hours at a time, watching people and looking at the scanner screen. They develop an expectation about how frequently certain violations occur. For example, they probably encounter containers of hand lotion or pocketknives fairly often, so they expect to see those and then look for them. On the other hand, they probably don't encounter loaded handguns or bomb parts very often. They create a mental model about how frequently any of these items will appear and then, unconsciously, start paying attention accordingly.

Andrew Bellenkes (1997) conducted research on this expectation and found that if people expect something to happen with a particular frequency, they often miss it if it happens more or less than their expectations. They have a mental model of how often something will occur, and they have set their attention to that mental model.



Signal If It's Infrequent and Important

I use my laptop for hours every day, and most of the time it's plugged in. But sometimes I forget to plug it in and my battery gets low. There is an indicator on my screen that constantly shows that the battery power is disappearing, but if I'm at home, I think I'm plugged in and I don't notice the indicator.

Eventually (about 8 percent of battery left), my computer makes a sound, and a message pops up to alert me that the battery is very low. This is an example of signaling when an event is infrequent but important. (I wish that the machine gave me the option of customizing when I want to be alerted, however. By the time I get the alert, the battery is really low. Then I run around panicked trying to find my plug or an outlet or saving files.)

Takeaways

- ✧ People will build an unconscious mental model of how often an event occurs.
- ✧ If you're designing a product or application where people need to notice an event that rarely occurs, use a strong signal to get their attention when it does.

44

SUSTAINED ATTENTION LASTS ABOUT 10 MINUTES

Imagine you're in a meeting and someone is presenting sales figures for the last quarter. How long can they hold your attention? If the topic is of interest to you and they're a good presenter, you can focus on the presentation for 7 to 10 minutes at most. If you're not interested in the topic or the presenter is particularly boring, then you'll lose interest much faster. **Figure 44.1** shows what the graph looks like.

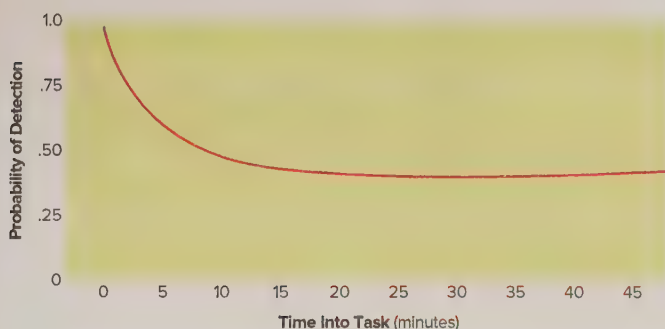


FIGURE 44.1 Attention starts to wane after 10 minutes

People can take a short break and then start over with another 7- to 10-minute period, but 7 to 10 minutes is about as long as we can pay attention to any one task.

If you're designing a website, you're probably designing pages that someone views for a lot less than 7 minutes. You're assuming that someone comes to the page, looks for a link, and clicks it. But sometimes you might add other media, such as audio or video. These media are subject to the 7- to 10-minute rule. TED videos are typically 20 minutes long, so they're going over the limit (although they have some of the world's greatest speakers and so might be able to stretch it).

Takeaways

- * Assume that you have at most 7 to 10 minutes of a person's attention.
- * If you must hold attention longer than 7 to 10 minutes, introduce novel information or a break.
- * Keep online demos or tutorials under 7 to 10 minutes in length.

45

PEOPLE PAY ATTENTION ONLY TO SALIENT CUES

Look at the pictures of a U.S. penny in **Figure 45.1**. Which one is the real penny? Don't cheat. Try to figure it out first, before you go get a penny to check.

If you live in the U.S. and use U.S. coins, then a penny is something you've probably seen a lot. But you only pay attention to certain attributes of the penny—for instance, its color and size. These are what psychologists call “salient cues.” You only pay attention to what you need for the task at hand. Although there's a lot of detail on the penny, a lot of cues, the salient ones for most people are color and size. If you're a coin collector, then the salient cues are different. Salient cues for a coin collector might include the date, wording, or particular pictures.

As we saw in the chapter “How People See,” you can look at something and not really see it. Similarly, every day you experience a lot of things through sight, sound, taste, and touch that you don't pay attention to. People are unconsciously aware that they have limited resources, and the brain therefore decides what it really needs to pay attention to and what it can ignore.

Did you guess the right penny? (It's A.)



FIGURE 45.1 Which is the real penny?

Takeaways

- ✦ Decide what the salient cues are for your audience.
- ✦ Design so that the salient cues are obvious.
- ✦ Realize that people will probably pay attention only to salient cues.

Many people think they are great at multitasking and even pride themselves on their multitasking abilities. But the research on multitasking shows that most people are worse at it than they think.

Most of the time what people are doing when they think they are multitasking is “task switching.” People can attend to only one task at a time. You can only think about one thing at a time. You can only conduct one mental activity at a time. So you can talk, or you can read. You can read, or you can type. You can listen, or you can read—one thing at a time. We are pretty good at switching back and forth quickly, so we *think* we are multitasking, but in reality most of the time we are not.

ONE EXCEPTION

Research has uncovered one exception: if you are doing a physical task that you have done very, very often and you are very good at, then you can do that physical task while you are doing a mental task. So if you are an adult and you have learned to walk, then you can walk and talk at the same time. Well, maybe. Even walking and talking doesn't always work very well. A study by Ira Hyman (2009) showed that people talking on their cellphones while walking ran into people (literally) more often and didn't notice what was around them. The researchers had someone in a clown suit ride a unicycle. The people talking on a cellphone were much less likely to notice or remember the clown.



Driving while on a cellphone is an attention problem

In many parts of the U.S., it is now illegal to drive while holding a cellphone, but it is okay to use a cellphone while driving if you have a hands-free phone. There's a flaw in this thinking. It's not the holding of the phone that is a problem—it's the conversation you are having with the other person. When you have a phone conversation, your attention is on the conversation, and therefore your attention is not on driving. It's an attention problem, not just a hands-free problem.



Overhearing someone talk on a cellphone is more annoying than overhearing two people in conversation

A one-sided conversation (or halfalogue) uses more of your mental resources because the information is less predictable. You're in suspense wondering what you're missing in the other half of the conversation. Lauren Emberson (2010) tested participants on different mental tasks. They performed much better on tasks when they heard both sides of a cellphone call than when they heard a halfalogue. The researchers controlled for acoustic factors (quality of the sound, and so on), so they concluded that this difference occurs because the halfalogue is unpredictable. Because participants are thinking about the half of the conversation they're missing, they are not paying attention to the task at hand.

DO AGE AND MULTITASKING EXPERIENCE MAKE A DIFFERENCE?

Eyal Ophir and Clifford Nass (2009) conducted a series of studies on college students and determined that they were no better at multitasking than the general population. They developed a questionnaire, which asked people how many different media they use simultaneously. They then picked people who were at either end of the spectrum: heavy media multitaskers (HMMs) and light media multitaskers (LMMs).

Next, they had people from each group perform several tasks. For example, they showed people two red rectangles alone or two red rectangles surrounded by four or six blue rectangles. These objects were flashed twice, and the participants had to decide whether the two red rectangles had moved from the first flash to the second. They were supposed to ignore the blue rectangles.

What they found was opposite to what they thought they would find. The LMMs were able to ignore the blue rectangles, but the HMMs had a harder time ignoring the blue rectangles and therefore did much worse on the task. Next they tried tasks that involved letters and numbers. The results were always the same: the HMMs were actually more distracted by irrelevant stimuli than the LMMs, and performed poorly on the tasks.

SOME PEOPLE ENJOY MULTITASKING

Although most people are worse at multitasking than they think, some people enjoy the experience. They like to watch sports on the TV while also texting with friends. But don't confuse liking the experience of multitasking with being good at it.



Watch a video on multitasking research

Watch a video about the Ophir and Nass research: www.youtube.com/watch?v=2zuDXzVYZ68.



Test your own multitasking skills

Take this test to see how good you are at multitasking: www.youtube.com/watch?v=IJU7gAWjZx8&t=10s.

Takeaways

- * People think they are better at multitasking than they are.
- * Some people like multitasking and may confuse liking it with being better at it.
- * Young people do not multitask better than older people.
- * Avoid forcing people to multitask. It is difficult for them to do two things at once (for example, have a conversation with a customer while filling out a form on a computer or tablet device). If people must multitask, pay particular attention to the ease of use of whatever tool they are using.
- * If you require people to multitask, expect them to make more errors. Build in ways for them to fix errors afterward.

47

DANGER, FOOD, SEX, MOVEMENT, FACES, AND STORIES GET THE MOST ATTENTION

Here's what grabs attention the most:

- ★ Anything that moves (for example, video or blinking)
- ★ Pictures of human faces, especially if they are looking right at you
- ★ Pictures of food, sex, or danger
- ★ Stories
- ★ Loud noises (covered in Number 48)

WHY PEOPLE CAN'T RESIST PAYING ATTENTION TO FOOD, SEX, AND DANGER

Have you ever wondered why traffic always slows when people are driving by an accident? Do you moan about the fact that people are attracted by the gruesome and yet find that you glance over too as you drive by? Well, it's not really your fault that you (and everybody else) can't resist looking at scenes of danger. It's your *old brain* telling you to PAY ATTENTION.

You have three brains

In my book *Neuro Web Design: What Makes Them Click?* I talk about the idea that you really don't have one brain, you have three. The *new brain* is the conscious, reasoning, logical brain that you think you know best, the *mid-brain* is the part that processes emotions, and the *old brain* is the part that is most interested in your survival. From an evolutionary perspective, the old brain developed first. In fact, that part of our brain is very similar to that of a reptile, which is why some people call it the "reptilian brain."

Can I eat it? Can I have sex with it? Will it kill me?

The job of your old brain is to constantly scan the environment and answer the questions "Can I eat it? Can I have sex with it? Will it kill me?" That's really all the old brain cares about (**Figure 47.1**). When you think about it, this is important. Without food you'll die, without sex the species won't survive, and if you're killed, the other two questions don't matter. So animal brains developed early on to care intensely about these three topics. As animals evolved they developed other capacities (emotions, logical thought), but a part of their brain was retained that always scans for these three critical things.



FIGURE 47.1 Looking at food is one of the things your old brain can't resist
(Photo by Guthrie Weinschenk)

So you can't resist

What this means is that you just can't resist noticing food, sex, or danger, no matter how hard you try not to. It's the old brain working. You don't necessarily have to do anything once you notice; for example, you don't have to eat the chocolate cake when you see it, you don't have to flirt with the attractive person who walked into the room, and you don't have to run away from the big, scary guy who walked in the room with the good-looking woman. But you *will* notice all of those things whether you want to or not.



Your attention is riveted by pictures of people

People are hard wired to pay attention to faces. Read the chapter “How People See” for more details on the parts of the brain that process faces.

Takeaways

- * It may not always be appropriate to use food, sex, or danger in your web page or software application, but if you do, they'll get a lot of attention.
- * Use up-close images of faces.
- * Use stories as much as you can, even for what you think is factual information.

48

LOUD NOISES STARTLE AND GET ATTENTION

If you want to get someone's attention with a sound, **Table 48.1** describes some choices and when to use each one (adapted from Deatherage, 1972).

TABLE 48.1 How to get attention with sounds

Audio alarm	Intensity	Attention-getting ability
Foghorn	Very high	Good, but not if there is a lot of other low-frequency noise
Regular horn	High	Good
Whistle	High	Good, but only if intermittent
Siren	High	Good if pitch rises and falls
Bell	Medium	Good when there is other low-frequency noise
Buzzer	Low to medium	Good
Chimes or gong	Low to medium	Fair

PEOPLE HABITUATE TO AUDITORY STIMULI

Have you visited with someone who had a clock that chimed every hour? You're lying in bed about to doze off, and there goes that darn clock again. "How can anyone get any sleep in this house?" you wonder. Yet everyone who lives in the house sleeps just fine. They have habituated to the sound of the clock chimes. Because they hear it every hour, they don't pay attention to it anymore.

Your unconscious mind is constantly surveying your environment making sure that nothing in it is dangerous. That's why anything new or novel in the environment will get your attention. But if the same signal occurs again and again, eventually your unconscious mind decides it is not new anymore and therefore starts to ignore it.

Takeaways

- * If you're designing an application, you may have control over the sounds that occur when people take certain actions (for example, making a mistake, reaching a goal, or donating money).
- * Pick a sound that is appropriate to the amount of attention you need. Save the high-attention sounds for when it's really important—for example, if someone is about to format their hard drive or take an action that can't be undone.
- * If you use sounds to get attention, then consider changing them so that people will not habituate and the sounds will continue to be attention-getting.

FOR PEOPLE TO PAY ATTENTION TO SOMETHING, THEY MUST FIRST PERCEIVE IT

For you to pay attention to something, you must be able to sense and perceive it. Here are some examples of the sensitivity of your senses:

Sight: If you're standing at a high point in total darkness, you can see a candle 30 miles away.

Sound: If you're in a very quiet room, you can hear a watch ticking 20 feet away.

Smell: You can smell a drop of perfume in about 800 square feet of space.

Touch: You can feel a human hair on your skin.

Taste: You can taste a teaspoon of sugar in two gallons of water.

SIGNAL DETECTION THEORY

If you can't find your watch and you're trying to figure out where you left it, then you'll hear it ticking if you're within 20 feet of it. But what if you aren't looking for your watch? What if you're unconcerned with your watch, and instead you're thinking about what to have for dinner. In that case you may not even realize that there's a watch ticking at all.

Detecting something is not necessarily simple. Your senses may perceive a stimulus, but that doesn't mean that you're paying attention to it.

Sensitivity and bias

Imagine you're expecting someone to come by and pick you up. They're late, and you keep running to the door thinking you heard the car in the driveway, even though you didn't.

Whether you perceive something or not depends on more than just the stimulus being there. In fact, sometimes the stimulus is there and you miss it, and sometimes it's not there and you think you hear or see it.

Scientists call this *signal detection theory*. There are four possible outcomes, as shown in **Figure 49.1**.

This is not just a conceptual idea. There are real cases that signal detection researchers study. Take, for example, a radiologist who looks at dozens of medical images every day. The radiologist has to decide if there is a small dot on the image and if it's cancer or

not. If they see a cancer dot when none is there (false alarm), then the patient may have surgery, radiation therapy, and chemotherapy when it's unnecessary. On the other hand, if they miss a cancer dot that was actually there, then the patient may die because treatment was not given early enough. Psychologists study the different conditions that make it more likely for people to detect a signal accurately.

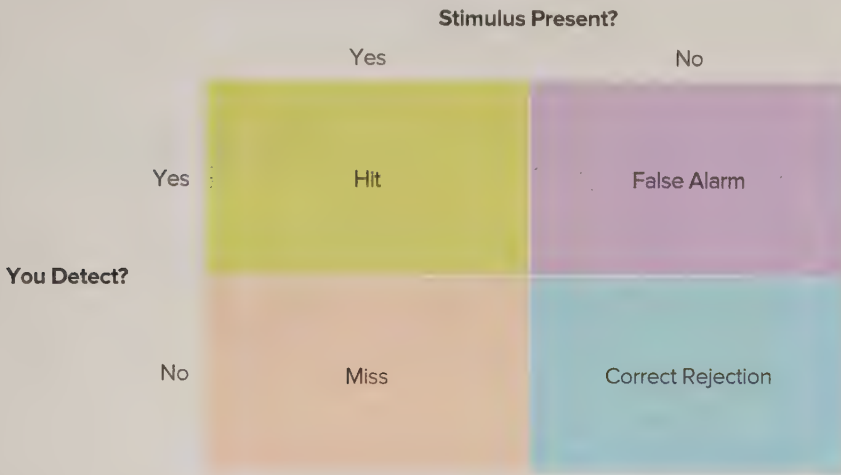


FIGURE 49.1 Signal detection theory

HOW TO APPLY SIGNAL DETECTION THEORY

Let's say you're designing a new system for air traffic controllers to see how many planes are near each other in the air space. You don't want misses, so you turn up the signal (use brighter lights, more sound) to make sure the controller doesn't miss the signal. If you were designing the screen to show X-ray results for the radiologist, you would turn down the signal a little bit to avoid false alarms.

Takeaways

- * If you're designing for a particular task, think about the four quadrants of the signal detection chart. Is it more damaging for people to have a false alarm or a miss?
- * Think about what you may need to do with your design based on the four quadrants of the signal detection chart. If a false alarm is worse, then tone down the signal. If a miss is worse, then make the signal stronger.

WHAT MOTIVATES PEOPLE

New research on motivation reveals that some of the supposedly tried-and-true methods for getting and keeping people motivated may have been tried, but they're not quite true.

You're given a frequent-buyer card for your local coffee shop. Each time you buy a cup of coffee you get a stamp on your card. When the card is filled, you get a free cup of coffee. Here are two different scenarios:

- ★ **Card A:** The card has 10 boxes for the stamps, and when you get the card, all the boxes are blank.
- ★ **Card B:** The card has 12 boxes for the stamps, and when you get the card the first two boxes are already stamped.

Question: How long will it take you to get the card filled up? Will it take more or less time for scenario A versus scenario B? After all, you have to buy 10 cups of coffee in both scenarios in order to get the free coffee. So does it make a difference which card you use?

The answer, apparently, is yes. You'll fill up the card faster with Card B than with Card A. And the reason is called the *goal-gradient effect*.

The goal-gradient effect was first studied in 1934 by Clark Hull using rats. He found that rats that were running a maze to get food at the end would run faster as they got to the end of the maze. The goal-gradient effect says that you will accelerate your behavior as you progress closer to your goal. The coffee reward card scenarios I describe above were part of a research study by Ran Kivetz (2006) to see if people would act like the rats did in the original 1934 study. And the answer is yes, they do.

Kivetz also found that people enjoyed being part of the rewards program. Compared to customers who were not part of the program, customers with reward cards smiled more, chatted longer with café employees, and left a tip more often.

In addition to the coffee shop study, Kivetz found that people would go to a website more frequently and rate more songs during each visit as they got closer to a reward goal at the site.



People focus on what's left more than on what's completed

Minjung Koo and Ayelet Fishbach (2010) conducted research to see which would motivate people more to reach a goal: A) focusing on what they'd already completed, or B) focusing on what remained to accomplish. The answer was B—people were more motivated to continue when they focused on what was left to do.



Motivation plummets right after a reward is reached

After customers reach the reward goal motivation, purchasing tends to plummet. This is referred to as a post-reward resetting phenomenon. You are most at risk of losing a customer right after a reward is reached.

Takeaways

- * The shorter the distance to the goal, the more motivated people are to reach it. People are even more motivated when the end is in sight.
- * You can get this extra motivation even with the illusion of progress, as in the coffee card B example in this section. There really isn't any progress (you still have to buy 10 coffees), but it seems like there has been some progress, so it has the same effect.
- * People enjoy being part of a reward program. But watch out. Activity plummets right after the goal is reached, and you are most at risk of losing a customer right after a reward is reached. You may want to have extra interactions after giving a reward (for example, you may want to send an email thanking them for being a loyal customer).

If you studied psychology in the twentieth century, you may remember B. F. Skinner and his work on operant conditioning. Skinner studied whether behavior increased or decreased based on how often, and in what manner, a *reinforcement* (reward) was given.

WHAT THE CASINOS KNOW

Let's say you put a rat in a cage with a bar. If the rat presses the bar, he gets a food pellet. The food pellet is called the reinforcement. But what if you set it up so that the rat does not get the food pellet every time he presses the bar? Skinner tested various scenarios and found that the frequency with which you gave the food pellet, and whether you gave it based on elapsed time or bar presses, affected how often the rat would press the bar. Here's a synopsis of the different schedules:

- ★ **Interval schedules.** You provide a food pellet after a certain interval of time has passed—for example, five minutes. The rat gets a food pellet the first time he presses the bar after five minutes is up.
- ★ **Ratio schedules.** Instead of basing the reinforcement on time, you base it on the number of bar presses. The rat gets a food pellet after every 10 bar presses.

There's another twist. You can have fixed or variable variations on each schedule. If it's a fixed schedule, then you keep the same interval or ratio—for example, every five minutes or every 10 presses. If it's variable, then you vary the time or ratio, but it averages out; for example, sometimes you provide the reinforcement after two minutes, sometimes after eight minutes, but it averages out to five minutes.

So altogether there are four possible schedules:

- ★ **Fixed interval.** Reinforcement is based on time, and the time interval is always the same.
- ★ **Variable interval.** Reinforcement is based on time. The amount of time varies, but it averages to a particular time interval.
- ★ **Fixed ratio.** Reinforcement is based on the number of bar presses, and the number is always the same.
- ★ **Variable ratio.** Reinforcement is based on the number of bar presses. The number varies, but it averages to a certain number of presses.

It turns out that rats (and people) behave in predictable ways based on the schedule you're using. **Figure 51.1** shows a chart of the kind of behavior you'll get based on the type of schedule.

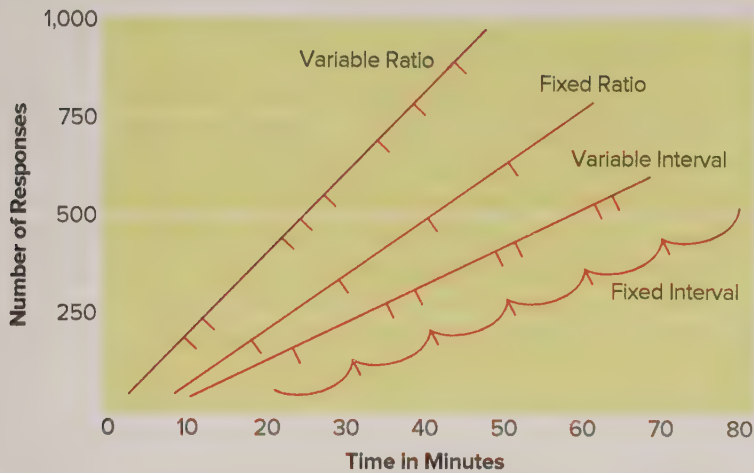


FIGURE 51.1 Reinforcement schedules for operant conditioning



Operant conditioning fell out of favor

In the 1960s and 1970s operant conditioning was *the* theory at many university psychology departments around the world. But many psychologists from other points of view (for example, cognitive or social psychology) were not fans, and it fell out of favor after that. Other learning and motivation theories became more popular, and these days operant conditioning gets maybe one lecture and a few pages in the textbook during a college Introductory Psychology class. If you haven't guessed, I was trained in operant conditioning during my undergraduate work, and I'm a fan. Although I do not believe that operant conditioning explains all behavior and motivation, I do believe that the theories are well tested, and they work. I've personally used them in my management style, in my classroom style when I'm teaching, and in my child-rearing practices.

You can predict, then, how often people will engage in a certain behavior based on the way they are reinforced or rewarded. If you want someone to engage in a certain behavior the most, then you would use a variable ratio schedule.

If you've ever been to Las Vegas, then chances are you've seen a variable ratio schedule in operation. You put your token in the slot machine and press the button. You

don't know how often you'll win. It's based not on time, but rather on the number of times you play. And it's not a fixed schedule, but a variable one. It's not predictable. You're not sure when you're going to win, but you know that your odds of winning increase the more times you play. So it will result in you playing the most (and the casino making the most money).

OPERANT THEORY AND DESIGN

If you're not sure that operant conditioning is related to design, think about it more deeply. Many times as designers you want to encourage people to engage in a certain behavior over and over. Take the study by Kivetz in the beginning of this chapter. The rewards card is actually an example of a fixed-ratio schedule: you buy 10 cups of coffee (press the bar 10 times), and then you get a free coffee.

Another example is Dropbox.com. For every friend you get to join Dropbox you receive extra storage space.

There is one more type of reinforcement schedule: continuous. If you get a reward every time you engage in a behavior, then you are on a continuous reinforcement schedule. Continuous reinforcement schedules are good to use when you are trying to establish a new behavior. But Skinner showed that once the behavior is established you will actually get more of the behavior if you do not give a reward every time. Dropbox might get more people recommending it to friends if it gave a larger reward for every three or five friends—in other words, if it switched to a fixed-ratio schedule rather than a continuous schedule.

Takeaways

- ★ For operant conditioning to work, the reinforcement (reward) must be something that particular audience wants. Hungry rats want food pellets. What does your particular audience really want?
- ★ Think about the pattern of behavior you're looking for, and then adjust the schedule of rewards to fit that schedule. Use a variable-ratio schedule for the maximum behavior repetition.
- ★ Use a continuous reward to set a new behavior, but then switch to a different schedule to keep people taking the action.

Do you ever feel like you're addicted to email or Twitter or texting? Do you find it impossible to ignore your email if you see a notification icon indicating that there are messages in your inbox? Have you ever searched online for something and realized 30 minutes later that you've been reading and linking and searching around for something totally different than your original search? These are all examples of your dopamine system at work.

Neuroscientists have been studying what they call the dopamine system since 1958, when it was identified by Arvid Carlsson and Nils-Ake Hillarp at the National Heart Institute of Sweden. Dopamine is created in various parts of the brain and is critical in all sorts of brain functions, including thinking, moving, sleeping, mood, attention, motivation, seeking, and reward.

PLEASURE CHEMICAL OR MOTIVATION CHEMICAL?

You may have heard that dopamine controls the “pleasure” systems of the brain that make you feel enjoyment. But researchers have found that instead of causing you to experience pleasure, dopamine actually causes you to want, desire, seek out, and search. It increases your general level of arousal, motivation, and goal-directed behavior. It's not only about physical needs such as food or sex, but also about abstract concepts. Dopamine makes you curious about ideas and fuels your search for information. The latest research shows that it is the opioid system, more than the dopamine system, that is involved in feelings of pleasure.

According to Kent Berridge (1998), these two systems—the “wanting” (dopamine) and the “liking” (opioid)—are complementary. The wanting system propels you to action, and the liking system makes you feel satisfied and therefore makes you pause your seeking. If your seeking isn't turned off, then you start to run in an endless loop. The dopamine system is stronger than the opioid system. You seek more than you are satisfied.



Dopamine evolved to keep us alive

Dopamine is critical from an evolutionary standpoint. If humans had not been driven by curiosity to seek out things and ideas, then they would have just sat in their caves. The dopamine seeking system kept our ancestors motivated to move through the world, learn, and survive. Seeking was more likely to keep them alive than was sitting around in a satisfied stupor.



Anticipation is better than getting

Brain scan research shows that our brains show more stimulation and activity when we *anticipate* a reward than when we get one. Research on rats shows that if you destroy dopamine neurons, rats can walk, chew, and swallow, but they will starve to death even when food is right next to them. They have lost the desire to go get the food.

Takeaways

- * People are motivated to keep seeking information.
- * The easier you make it for people to find information, the more information-seeking behavior they will engage in.

Dopamine is also stimulated by unpredictability. When something happens that is not exactly predictable, it stimulates the dopamine system. Think about electronic devices. Emails and tweets and texts show up, but you don't know exactly when they will arrive or who they will be from. It's unpredictable. This is exactly what stimulates the dopamine system. It's the same system at work for gambling and slot machines. Basically, email, Twitter, and most social media run on the variable-ratio schedule discussed earlier in this chapter. That makes it likely that people will engage in the behavior again and again.

THE PAVLOVIAN REFLEX

The dopamine system is especially sensitive to cues that a reward is coming. If there is a small, specific cue that signifies that something is going to happen, that sets off your dopamine system. This is a Pavlovian response, named for the Russian scientist Ivan Pavlov, who experimented with dogs. When dogs (and humans) see food, they begin to salivate. Pavlov paired food with a sound—for instance, a bell. The bell is a stimulus. Every time the dogs saw food they would also hear a bell, and they would salivate at the sight of the food. After a while the dogs would salivate at the sound of the bell. The food wasn't even necessary for salivation to occur. When a stimulus is paired with information-seeking behavior, such as a sound and a message when a text or email arrives on your phone (**Figure 53.1**), you have the same Pavlovian response—dopamine is released and the information seeking starts all over again.

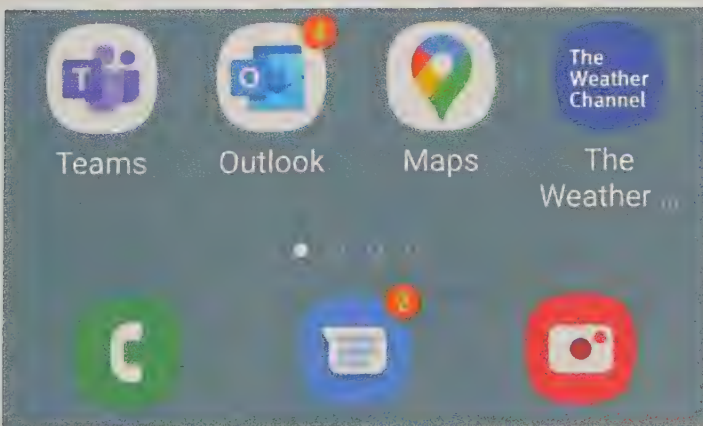


FIGURE 53.1 Getting a notification that you have a message is a Pavlovian cue

SMALL AMOUNTS ARE EVEN MORE ADDICTIVE

The dopamine system is most powerfully stimulated when the information comes in small amounts so that it doesn't fully satisfy the desire for information. A short text is ideally suited to sending the dopamine system raging.

THE DOPAMINE LOOP

Our technology tools and notifications provide almost instant gratification of our desire to seek. Want to talk to someone right away? Send a text and they respond in a few seconds. Want to look up some information? Just search online. Want to see what your friends are up to? Go to your favorite social media app. You can get into a dopamine-induced loop: dopamine starts you seeking, you get rewarded for seeking, and that makes you seek more. It becomes harder and harder to stop looking and checking to see if you have a new message.



How to break dopamine loops

In contrast to wanting to set up dopamine loops, you might be tired of being in one yourself. The constant stimulation of the dopamine system can be exhausting. To break a dopamine loop you need to get away from the information-seeking environment—that is, turn off your devices, leave them out of sight and reach, or both. One of the most powerful things you can do to end a dopamine loop is to turn off the notifications that tell you that a message has arrived.

Takeaways

- * Pairing cues such as sounds with the arrival of information motivates people to seek more.
- * Giving small bits of information and then providing a way for people to get more information results in more information-seeking behavior.
- * The more unpredictable the arrival of information is, the more people will be addicted to seeking it.

PEOPLE ARE MORE MOTIVATED BY INTRINSIC REWARDS THAN BY EXTRINSIC REWARDS

Let's say you're an art teacher, and you want to encourage your class to spend more time drawing. You create a Good Drawing Certificate to give to your students. If your goal is to have them draw more and to stick with it, how should you give them the certificate? Should you give them one every time they draw? Or only sometimes?

Mark Lepper, David Greene, and Richard Nisbett (1973) conducted research on this question. They divided children into three groups:

- ★ Group 1 was the Expected group. The researchers showed the children the Good Drawing Certificate and asked if they wanted to draw in order to get the certificate.
- ★ Group 2 was the Unexpected group. The researchers asked the children if they wanted to draw but didn't mention anything about a certificate. After the children spent time drawing, they received an unexpected drawing certificate.
- ★ Group 3 was the control group. The researchers asked the children if they wanted to draw but didn't mention a certificate and didn't give them one.

The real part of the experiment came two weeks later. During playtime the drawing tools were put out in the room. The children weren't asked anything about drawing; the tools were just put in the room and available. What happened? Children in the Unexpected group and the control group spent the most time drawing. The children in the Expected group, the ones who had received an expected reward, spent the least time drawing. *Contingent* rewards (rewards given based on specific behavior that is spelled out ahead of time) resulted in less of the desired behavior if the reward was not repeated. The researchers went on to do more studies like this, with adults as well as children, and found similar results.



Goals are sometimes unconscious

You have the experience of deciding to achieve a particular goal, and so you think that shows that motivation is a conscious process. But research by Ruud Custers and Henk Aarts (2010) shows that at least some goals occur unconsciously. Your unconscious sets the goal and then eventually the goal surfaces to conscious thought.



Promising monetary rewards releases dopamine

Brian Knutson (2001) found that when people are promised a monetary reward for work, there is increased activity in the nucleus accumbens—the same area that is active when people anticipate cocaine, tobacco, or any addictive substance. Dopamine is released, and there is an increase in risky behavior. Giving people money backfires, since they'll come to rely on the monetary reward and then be unwilling to work unless there is a monetary incentive.

FROM ALGORITHMIC WORK TO HEURISTIC WORK

In *Drive* (2009), Daniel Pink writes that until recently most work involved algorithmic work—follow a procedure to accomplish a task. But now 70 percent of people (in developing countries) do heuristic work—there are no set procedures. Traditional punishments and rewards are based on extrinsic motivation and work well for algorithmic work, not for heuristic work. Heuristic work assumes the work itself provides intrinsic motivation through a sense of accomplishment.



People are motivated by the possibility of being connected

In the “People Are Social Animals” chapter, I cover how social people are and how being social affects expectations and behaviors. The opportunity to be social is also a strong motivating factor. People will be motivated to use a product just because it allows them to connect with others.

Takeaways

- ✱ Don't assume that money or any other extrinsic reward is the best way to reward people. Look for intrinsic rewards rather than extrinsic rewards.
- ✱ If you're going to give an extrinsic reward, it will be more motivating if it is unexpected.
- ✱ If the product you're designing allows people to connect with other people, then they will be motivated to use it.

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PEOPLE ARE MOTIVATED BY PROGRESS, MASTERY, AND CONTROL

Why do people donate their time and creative thought process to Wikipedia? Or the open source movement? When you stop and think about it, you realize that there are many activities that people engage in, even over a long period of time, that require high expertise and yet offer no monetary or even career-building benefit. People like to feel that they are making progress. They like to feel that they are learning and mastering new knowledge and skills.

SMALL SIGNS OF PROGRESS CAN HAVE A BIG EFFECT

Because mastery is such a powerful motivator, even small signs of progress can have a large effect in motivating people to move forward to the next step in a task. For example, **Figure 55.1** shows how much progress I've made in completing an online course.

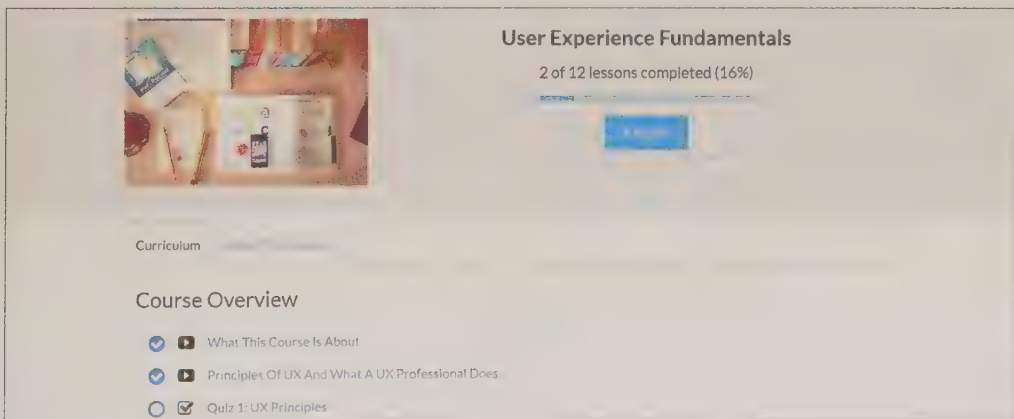


FIGURE 55.1 Showing even small signs of progress can motivate people to keep going



Want to learn more about this concept? Check out the video below.

Daniel Pink provides a great animated video about the ideas in his book Drive: www.youtube.com/watch?v=u6XAPnuFjJc.



Mastery can never actually be reached

In *Drive*, Daniel Pink says that mastery can be approached but never really reached.

Figure 55.2 shows what this constant getting closer but never reaching looks like on a graph. The graph is known as an asymptote. You can get better and better, but you don't really reach an endpoint. This is one of the factors that makes mastery such a compelling motivator.



FIGURE 55.2 According to Daniel Pink, mastery is an asymptote—it can never be fully reached

Takeaways

- * If you want to build loyalty and have repeat customers (for example, repeat visitors to your website), you'll need to have activities that people inherently want to do (such as connecting with their friends or mastering something new), rather than just activities for which people are getting paid.
- * If people have to do a task that's boring, you can help motivate them by acknowledging that it's boring and then letting them do it their own way.
- * Look for ways to help people set goals and track them.
- * Show people how they're progressing toward goals.

Jessica Nolan (2008) wanted to know if it is possible to change behavior just by giving people information, and if it is, what type of information is most likely to result in behavior change.

Nolan created five messages about using less electricity:

1. Using less electricity protects the environment.
2. Using less electricity makes you more socially responsible.
3. Using less electricity saves you money.
4. Your neighbors used less electricity.
5. Here's the amount of electricity you used.

The only group that ended up using less electricity was the one that heard message 4. When people were given information (by the way, this was actual data) that showed how their own electrical usage compared to the other homes in their neighborhood, then they changed their behavior.

People are very influenced by the behavior of others. Most people tend to follow the norms or behavior of those around them, and if they are given information about their own behavior and the normative behavior, most people will change their behavior to better match what others are doing.

Takeaways

- * People are very sensitive to how their behavior aligns with the behavior of others.
- * If you want to change behavior, a good method is to let people know what others are doing. They will likely start to change their own behavior to line up with the social norms.
- * To make use of social norms, provide information in your content about what others are doing, and, if possible, directly show how others' data or information is similar to or different from your users' own.



PEOPLE ARE INHERENTLY LAZY

It might be exaggerating a bit to say that people are inherently lazy. But research does show us that people will do the least amount of work possible to get a task done.

IS LAZY ANOTHER WORD FOR EFFICIENT?

Over eons of evolution, humans have learned that they will survive longer and better if they conserve their energy. You want to spend enough energy to have sufficient resources (food, water, sex, shelter), but beyond that you are wasting your energy if you spend too much time running around getting or doing more stuff. Of course, questions about how much is enough, whether we have enough stuff yet, and how long should the stuff will last (and on and on) still vex us, but putting the philosophical questions aside, for most activities most of the time, humans work on a principle called *satisficing*.

SATISFY PLUS SUFFICE EQUALS SATISFICE

Herbert Simon is credited with coining the term *satisfice*. He used it to describe a decision-making strategy in which the person decides to pick the option that is adequate rather than optimal. The idea of satisficing is that the cost of making a complete analysis of all the options is not only not worth it but might be impossible. According to Simon we often don't have the cognitive faculties to weigh all the options. It makes more sense to make a decision based on "what will do" or what is "good enough" rather than trying to find the optimal or perfect solution. If people satisfice rather than optimize, there are implications for the design of websites, software, and other products.

DESIGN WEBSITES FOR SCANNING, NOT READING

In his book *Don't Make Me Think* (2005), Steve Krug applies the idea of satisficing to the behavior you can observe when someone comes to your website. You're hoping the visitor will read the whole page, but, as Krug says, "What they actually do most of the time (if we're lucky) is *glance* at each new page, scan *some* of the text, and click the first link that catches their interest or vaguely resembles the thing they're looking for. There are usually large parts of the page that they don't even look at." Krug talks about web pages being like billboards. You have to assume that people are taking a quick glance.

Keeping this idea in mind, look quickly at **Figures 57.1** and **57.2**, from two government websites in the U.S.

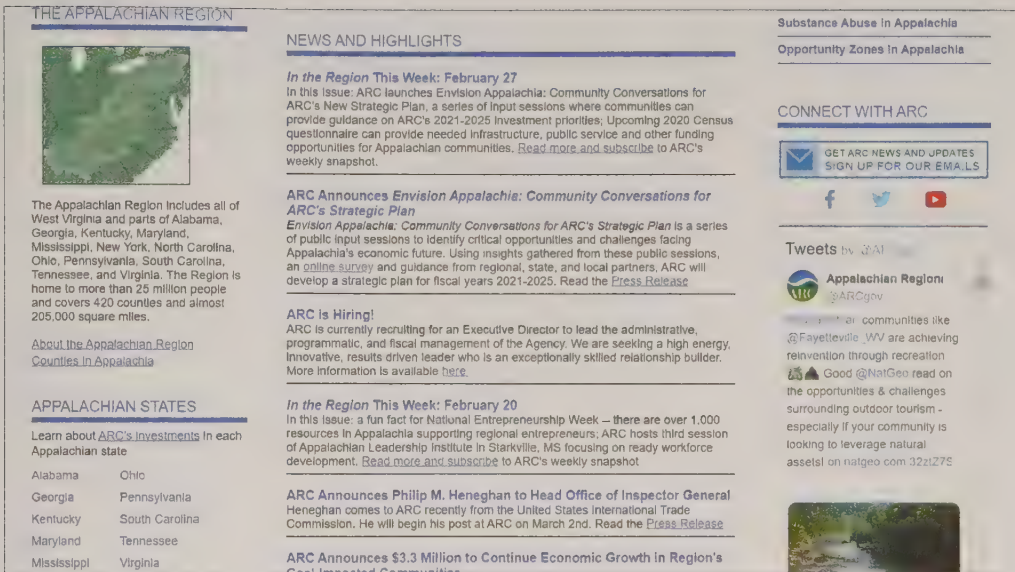


FIGURE 57.1 National Appalachian Region website



FIGURE 57.2 Medicare website

With this quick look you might get the feeling that the Appalachian website will require more work to use than the Medicare website. You make a decision that a particular website will be easy to use based on the impression the site provides in one or two seconds of viewing. The Medicare website has a larger font, better division of space, and less on the page compared with the Appalachian website.

The first impressions about satisficing can be critically important in determining whether someone stays at the website or not.

Takeaways

- * Assume that people will get things done with the least amount of work possible. That may not always be the case, but it's true more often than not.
- * People will satisfice—that is, look for the good-enough solution rather than the optimal solution.
- * The first glance at a page influences the impression about whether it will be easy to use. Large fonts and enough white space at first glance makes a website seem easier to use.

Do you use keyboard shortcuts when you're typing? Do you use some, but not others? Why do you do that?

People will look for ways to do something faster and with fewer steps. This is especially true if it's a task they're doing over and over. But if the shortcut is too hard to find or if a habit is ingrained, then people will keep doing it the old way. This seems paradoxical, but it's all about the perceived amount of work. If it seems like too much work to find a shortcut, then people will stay with their old habits (they are even satisficing about satisficing).

PROVIDE DEFAULTS

Defaults reduce the amount of work needed to complete a task. When you provide defaults—for example, filling in the person's name and address automatically on a form—then there is less work to finish the form. But there are some potential problems with defaults. One is that people don't always notice defaults and so may end up accepting a default without meaning to. Here again, the answer lies in the amount of effort. If it takes a lot of work to change the result of accepting “wrong” defaults, then think twice about using them in your design.

When defaults create more work, not less

Recently I bought a pair of shoes for my daughter. The next time I went to the website, it was to buy a pair of shoes for myself. But the default shipping address was the last address used—my daughter's, not mine. I didn't notice that the shipping address had filled in with a default that was not my home address. My daughter was surprised to get a pair of shoes she hadn't asked for. In this case, having a default in place meant a lot more work for both my daughter and me.

Takeaways

- * Provide shortcuts as long as they are easy to learn, find, and use, but don't assume that people will always use them.
- * Provide defaults if you know what most people will want to do most of the time and if the result of choosing a default by mistake does not cause costly errors.

A man is walking down a busy city street on his way to an appointment, and he sees what looks like a college student drop a folder of papers. The papers scatter on the ground, and the man glances over but keeps on walking. What do you think? Why didn't the man stop to help with the papers?

If you answer, "Well, he's a self-absorbed person who doesn't usually help out strangers on the street," then chances are likely that you have just made a *fundamental attribution* error. People have a tendency to give personality-based explanations for other people's behavior more weight than situational factors. Alternatively, instead of explaining the person's behavior in the story as being due to his "self-absorption," you might ascribe his behavior to the situation—for example, "He's late for a critical meeting with the bank and doesn't have time to stop today. In other circumstances he would have stopped." But in reality you don't apply that situational motivation to him. You assume it's not the situation but his personality that is causing his behavior.

BUT FOR YOU, IT'S SITUATIONAL

On the other hand, if you're analyzing and explaining your own behavior and motivations, then you will tend to think the opposite of what you attribute to others. In other words, you assume that your motivation and behavior are based on a reaction to the situation, not to personality factors. If you didn't stop and help the person pick up the papers, you would say it was because you were late for your meeting and didn't have time to stop, or some other situation-based explanation.

Research on the fundamental attribution error shows the following:

- ★ In cultures that value individualistic behavior (like the U.S.), it's common to ascribe other people's behavior to personality. The fundamental attribution error is common in these cultures.
- ★ On the other hand, in individualistic cultures people tend to ascribe their own behavior to situational factors more than to personality factors.
- ★ In cultures that value collectivist behavior (China, for example), people make the same fundamental attribution error, but not as often as in individualistic cultures.

Most of the research has to do with individuals deciding whether their actions are influenced by their personality versus situational factors. It seems that they are. People

attribute the decisions of an “other group” to the individual member’s attitudes but attribute the decisions of their own group to the collective group rules.

PEOPLE CAN’T STOP IT EVEN WHEN THEY KNOW THEY’RE DOING IT

Research shows that it’s very hard to stop making fundamental attribution errors. Even when you know you’re doing it, and even if you know it’s not accurate, you’ll still make the same error.



People are more willing to donate money to help victims of natural, as opposed to man-made, disasters

Hanna Zagefka (2010) asked people to read a fictitious news report about an island flooding disaster. One group of people read a report that implied that part of the reason for the flood was that the island’s dams were not built effectively. A second group read a report that implied that the flood occurred because the storm was unusually strong and didn’t mention the dams being built incorrectly. Participants in the first group were less willing to donate money than those in the second group.

Similar results were found in another study about giving money to people affected by the 2004 tsunami versus the civil war in Darfur. If the researchers emphasized that the Darfur war was caused by ethnic conflict, then participants were less willing to donate because they saw it as caused by humans.

Zagefka performed additional research and always found the same result. If participants thought the disaster was man-made and that people could have done something differently, then participants were more willing to blame the people for the disaster.

Takeaways

- * If you’re interviewing a subject matter expert or domain expert who’s telling you what people do or will do, think carefully about what you’re hearing. The expert may miss situational factors and put too much value on people’s personalities.
- * Try to build in ways to crosscheck your own biases. If your work requires you to make a lot of decisions about why people do what they do, you might want to stop before acting on your decisions and ask yourself, “Am I making a fundamental attribution error?”



FORMING OR CHANGING A HABIT IS EASIER THAN YOU THINK

Have you ever heard that it takes 60 days to form or change a habit? Well, that's actually not true. I used to write about that being true, but new research and a mindset shift for me made me realize that habits can be very easy to create or change.

Whether you realize it or not, a lot of your daily behavior is composed of habits. These are automatic behaviors that you do without thinking. You do them the same way every day.

Think about all the habits that you don't even remember trying to create. Perhaps you put your keys in the same pocket when you walk out the door, or maybe you have a routine that you go through every weekday when you wake up.

You probably have routines around hundreds of things, for example:

- ★ How you get from your home to work
- ★ What you do as soon as you get to your place of work
- ★ How you clean your house or apartment
- ★ How you do laundry
- ★ How you shop for a gift for a relative
- ★ How you exercise
- ★ How you wash your hair
- ★ How you water your houseplants
- ★ How you take your dog for a walk
- ★ How you feed your cat
- ★ How you put your children to bed at night
- ★ And so on.

How did you end up with so many habits if they are so hard to create?

For most people most of the time, habits are created unconsciously, and they are carried out automatically. Habits help us all to do the many hundreds of things we need and want to do in our lives. Because we can carry out a habit without having to think about it, it frees up our thought processes to work on other things. It's a clever trick that our brains have evolved to make us more efficient.

Habits are actually another form of Pavlov's classical conditioning. Here's what we know about the science of habits:

1. If you want someone's behavior to become habitual, then make the actions they need to take very small and easy. For example, let's say that you have a new social media channel and you want people to make it a habit to go to the app and check it often. You want that checking behavior to become a habit. The first step, then, is to be sure that it is really easy and clear how to check for activity in the channel. When they first use the app, send them a message with a notification that shows up whenever there is activity.
2. Actions that involve physical movement are easier to "condition" into a habit. Even a small physical movement, like a button press or a swipe on a cell-phone, is enough of a physical movement to help set a habit. This is why the apps that involve a physical movement (swiping, scrolling, clicking) become habits so easily.
3. Habits that are associated with auditory cues, visual cues, or both will be easier to create and maintain. This is why notifications cause certain apps to become a habit.

Takeaways

- * Give people a small, easy task to do rather than a complex one.
- * Build in auditory cues, visual cues, or both.
- * Include some type of physical movement (click, swipe, scroll).

PEOPLE ARE MORE MOTIVATED TO COMPETE WHEN THERE ARE FEWER COMPETITORS

Did you take standardized tests like the SAT and ACT to get into college? How many people were in the room when you took the test? What does it matter? Research by Stephen Garcia and Avishalom Tor (2009) shows that it may matter a lot. Garcia and Tor first compared SAT scores for locations that had many people in the room taking the test with locations that had smaller numbers. They adjusted the scores to control for the educational budget in that region and other factors. Students who took the SAT test in a room with fewer people scored higher. Garcia and Tor hypothesized that when there are only a few competitors, you (perhaps unconsciously) feel that you can come out on top, and so you try harder. And, the theory goes, when there are more people, it's harder to assess where you stand and therefore you're less motivated to try to come out on top. They called this the *N* effect, with *N* equaling "number," as in formulas.

COMPETING AGAINST 10 VS. COMPETING AGAINST 100

Garcia and Tor decided to test their theory in the lab. They asked students to complete a short quiz and told them to complete it as quickly and accurately as possible. They were told that the top 20 percent would receive \$5. Group A was told that they were competing against 10 other students. Group B was told that they were competing against 100 other students. Participants in Group A completed the quiz significantly faster than those in Group B—Group A had greater motivation knowing they were competing against fewer people. The interesting thing is that there was no one actually in the room with them. They were just told that other people were taking the test.

BUILDING IN COMPETITION

If and when you are designing a product that has competition, whether it is software for tracking sales for different members of the sales team or a game, if you are building in competition you may want to pay attention to what this research is saying about competition.

It's common to see products with leaderboards that list dozens or even hundreds of names. To keep people motivated you may want to show only the top 10 on the leaderboard.

Takeaways

- * Competition can be motivating, but you can also overdo it.
- * Showing more than 10 competitors can dampen the motivation to compete.

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PEOPLE ARE MOTIVATED BY
AUTONOMY

How many times in a typical day or week do you go to a self-serve website or product—an ATM, the website to renew your car registration, or a banking app? How many products do you use that allow you to do things yourself rather than having to go through another person?

You've probably heard people complain about self-service ("What happened to the good old days when you could talk to an actual person?"), especially older people who remember the days before self-service. But people actually like to be independent, to feel that they're doing things on their own with minimal help from others. People like to do things the way they want to do them and when they want to do them. People like autonomy.



Autonomy motivates people because it makes them feel in control

The unconscious part of the brain likes to feel that it's in control. If you're in control, then there is less likelihood that you'll be in danger. The "old brain" is all about keeping you out of danger. Control equals keep out of danger equals do it yourself equals motivated by autonomy.

Takeaways

- * People like to do things themselves and are motivated to do so.
- * If you want to increase the amount of self-service, make sure your messaging is about having control and being able to do it yourself.

PEOPLE ARE SOCIAL ANIMALS

We underestimate how important it is for people to be social. People will use whatever is around them to be social, and that includes technology. This chapter looks at the science behind social interactions.

THE “STRONG TIE” GROUP SIZE LIMIT IS 150 PEOPLE

You have people who you follow on your social media accounts, and people who follow you. Then there are the colleagues you work with, people you know from community organizations like schools and churches, your personal friends, and your family members. How many people are in your network overall?

DUNBAR’S NUMBER

Evolutionary anthropologists study social groups in animals. One question they have been trying to answer is whether there is a limit on how many individuals different species can have in their social group. Robin Dunbar (1998) studied different species of animals. He wanted to know if there was a relationship between brain size (specifically the neocortex) and the number of stable relationships in social groups. He came up with a formula for calculating the limit for different groups. Anthropologists call this Dunbar’s number.

THE SOCIAL GROUP SIZE LIMIT FOR HUMANS

Based on his findings with animals, Dunbar then extrapolated what the number would be for humans. He calculated that 150 people is the social group size limit for humans. (To be more exact, he calculated the number at 148 but rounded up to 150. Also, there is a fairly large error measure, so the 95 percent confidence interval is from 100 to 230—for you statistics experts out there.)



Dunbar’s number holds across time and cultures

Dunbar has documented the size of communities in different geographic areas and throughout different historical time frames, and he is convinced that this number holds true for humans across cultures, geographies, and time frames.

He assumes that the current size of the human neocortex showed up about 250,000 years ago, so he started his research with hunter-gatherer communities. He found that Neolithic farming villages averaged 150 people, as did Hutterite settlements, professional armies from the Roman days, and modern army units.

There's a limit to stable social relationships

The limit specifically refers to the number of people with whom you can maintain stable social relationships. These are relationships where you know who each person is and you know how each person relates to every other person in the group.

DOES THAT NUMBER SEEM LOW TO YOU?

When I talk about Dunbar's number of 150 for humans, most people think that is way too low. They have many more connections than that. Actually, 150 is the group size for communities that have a high incentive to stay together. If the group has intense survival pressure, then it stays at the 150-member mark and stays in physical proximity. If the survival pressure is not intense or the group is physically dispersed, then he estimates the number would be even lower. This means that, for most of us in our modern society, the number would not even be as high as 150. In the world of social media, people may have hundreds or even thousands of connections through a social media channel. A Dunbar's number advocate, however, would respond that these are not the strong, stable relationships that Dunbar is talking about, where everyone knows everyone and people are in proximity.

IS IT THE WEAK TIES THAT ARE IMPORTANT?

Some critics of Dunbar's number say that what's really important in social media is not the strong ties that Dunbar talks about, but the weak ties—relationships that don't require everyone to know everyone else in the group and that are not based on physical proximity. (Weak does not imply less important in this context.) For example, our social media connections are mainly weak ties.

PURPOSELY DESIGNING FOR STRONG OR WEAK

If you are building social or community features into a product, app, or service that you are creating, you may want to stop and think about whether what you are building is meant to be a strong-tie or weak-tie community. Are you assuming that people will connect with hundreds or thousands of people in the community? If so, then you are building a weak-tie community. Or perhaps you are planning smaller communities of 150 or less? If so, then you are building a strong-tie community.

If it's a weak-tie community, then numbers are important, and it's not necessary for everyone to know how everyone else is connected.

If it's a strong-tie community, then assume that each person will have fewer than 150 connections, and consider showing how everyone in a person's community is connected.



An interview with Robin Dunbar

Here's a video interview with Robin Dunbar: www.guardian.co.uk/technology/video/2010/mar/12/dunbar-evolution.

Takeaways

- * There is a limit of approximately 150 people for strong-tie groups. Weak-tie groups can be much larger.
- * If you are designing a product that has social connections or a community built in, think about whether those interactions are for strong or weak ties.
- * If you are designing for strong ties, you need to build in some amount of physical proximity and make it possible for people to interact, know each other in the network, and know how everyone in their own network is connected.
- * If you are designing for weak ties, don't rely on direct communication among all people in a person's network or on physical proximity.

If you put your face right in front of a baby and stick out your tongue, the baby will stick out his or her tongue too. This happens from a very young age, even as young as a month old. So what does this have to do with anything? It's an example of our built-in, wired-into-the-brain capacity for imitation. Research on the brain shows how our imitative behavior works and how to use imitation in your products to influence behavior.

MIRROR NEURONS FIRING

The front of the brain contains an area called the premotor cortex (motor as in movement). This is not the part of the brain that actually sends out the signals that make you move. *That* part of the brain is the primary motor cortex. The premotor cortex makes *plans* to move.

Let's say you're holding an ice cream cone. You notice that the ice cream is dripping, and you think that maybe you should lick off the dripping part before it drips on your shirt. If you were hooked up to an fMRI machine, you would first see the premotor cortex lighting up while you're thinking about licking off the dripping cone, and then you would see the primary motor cortex light as you move your arm.

Now let's say it's not you that has the dripping ice cream cone. It's your friend. You are watching your friend's cone start to drip. If you watch your friend lift his arm and lick the dripping cone, a subset of the same neurons also fire in your premotor cortex. Just watching other people take an action causes some of the same neurons to fire as if you were actually preparing to take the action yourself. This subset of neurons has been dubbed *mirror neurons*.



Mirror neurons are the starting point of empathy.

The latest theories are that mirror neurons are also the way we empathize with others. We are literally experiencing what others are experiencing through these mirror neurons, and that allows us to deeply, and literally, understand how another person feels.



Mimicking other people's body language makes them like you more

Watch two people talking. If you observe them closely, you will see that over time the two people start to imitate each other's body language. If one leans in, the other leans in. If one touches his face, the other person touches his face.

Tanya Chartrand and John Bargh (1999) had people sit down and talk with someone (a "confederate" who was actually part of the experiment, but the participants didn't know that). The confederates would vary their gestures and movements in a planned way. Some confederates were told to smile a lot, others to touch their faces, and others to jiggle their feet. The participants in the study would start to (unconsciously) imitate their confederates. Some behaviors increased more than others. Face touching increased by 20 percent, but foot jiggling increased by 50 percent.

In another experiment Chartrand and Bargh had two groups. In one group, the confederate imitated the participant's movements, and in the second group the confederate did not imitate the participant. After the conversation, the participants were asked how much they liked the confederate and how well they thought the interaction had gone. The group in which the confederate had imitated the participant gave the confederate and the interaction overall higher ratings than the group in which the confederate had not imitated the participant.



V. S. Ramachandran's research on mirror neurons

Vilayanur Ramachandran is one of the leading researchers on mirror neurons. I recommend that you watch this TED talk, in which he describes his research: <http://bit.ly/aaiXba>.

Takeaways

- ★ Don't underestimate the power of watching someone else do something. If you want to influence someone's behavior, show someone else doing the same task.
- ★ Research shows that stories create images in the mind that may also trigger mirror neurons. Use stories if you want to get people to take an action.
- ★ Video at a website is especially compelling. Want people to get a flu shot? Then show a video of people in line at a clinic getting a flu shot. Want kids to eat vegetables? Then show a video of other kids eating vegetables. Mirror neurons at work.

What do members of a marching band, fans cheering at a high school football game, and people at church have in common? They are all engaging in *synchronous activity*. Anthropologists have long been interested in rituals in certain cultures, such as drumming, dancing, and singing. Scott Wiltermuth and Chip Heath (2009) conducted a series of studies to examine in more detail whether, and how, synchronous behavior affects how people cooperate. They tested combinations of walking in step, not walking in step, singing together, and other movements with groups of participants. What they found was that people who engaged in synchronous activities were more cooperative in completing subsequent tasks and more willing to make personal sacrifices in order to benefit the group.

Synchronous activities are actions you take together with others, where everyone is doing the same thing at the same time in physical proximity to one another. Dancing, tai chi, yoga, singing, and chanting in time as a group are all examples of synchronous activity.

Wiltermuth and Heath's research also showed that you don't have to feel good about the group, or the group activity, in order to be more cooperative. Just the act of doing the synchronous activity seems to strengthen social attachment among the group members.

BONDING IN ONLINE COMMUNITIES

But how do you build in bonding for online communities? Some online communities are synchronous or almost synchronous. Conference calls and multiplayer games are synchronous. Texting and messaging apps are often almost synchronous. But even if these are synchronous communities, it might be hard to have the community engage in synchronous activities. Online communities don't usually sing, drum, dance, or even clap in unison.

This is a major reason why online communities don't gel together as much as in-person communities do.



Do people need synchronous activity to be happy?

In his article “Hive Psychology, Happiness, and Public Policy,” Jonathan Haidt (2008) connects synchronous activity and mirror neurons with anthropology and evolutionary psychology. Essentially his hypothesis is that synchronous activity promotes bonding and therefore helps the group survive. Mirror neurons are involved in synchronous activity, and there is a certain type of happiness that humans can’t get any other way than engaging in synchronous activity.

Takeaways

- * Because most online interactions don’t take place with others in physical proximity, there are limited opportunities for designers to build in synchronous activity.
- * Possible opportunities to build synchronous activity into your product include using live video streaming or a live video or audio connection.



PEOPLE EXPECT ONLINE INTERACTIONS TO FOLLOW SOCIAL RULES

When people interact with each other, they follow rules and guidelines for social interaction. Let's say you're sitting outside a café when your friend Mark sees you sitting by the window. Mark comes over to you and says, "Hi Richard, how are you doing today?" Mark expects you to interact with him, and he expects that interaction to follow a certain protocol. He expects you to look at him—in fact, to look him in the eye. If your previous interactions have been positive, then he expects you to smile a little bit. Next, you're supposed to respond to him by saying something like, "I'm fine. I'm sitting outside here to enjoy the beautiful weather." Where the conversation goes next depends on how well you know each other. If you're casual acquaintances, then he might wind down the conversation: "Well, enjoy it while you can. Bye!" If you're close friends, then he might pull up a chair and engage in a longer conversation.

You both have expectations of how the interaction will go, and if either of you violates the expectations, then you'll get uncomfortable. For example, what if Mark starts the conversation with "Hi, Richard, how are you today?" but you don't respond? What if you ignore him? Or you won't look at him? What if you answered, "My sister never liked the color blue" and stared into space? Or what if you responded with information that was a bit too personal? Any of these scenarios would make Mark uncomfortable. He would probably try to end the conversation as quickly as possible and avoid interacting with you the next time the opportunity arose.

ONLINE INTERACTIONS HAVE THE SAME RULES

The same is true of online interactions. When you go to a website or use an app, you have assumptions about how the product will respond to you and what the interaction will be like. And many of these expectations mirror the expectations that you have for person-to-person interactions. If the website is not responsive or takes too long to load, it's like the person you're speaking to is not looking at you or is ignoring you. If the site asks for personal information too early in the interaction, that's like a person getting too personal. If the app does not save your information from session to session, that's like a person not recognizing you or not remembering that you know each other.

Recently the public library in my county came out with a new app for borrowing books online. I'm an avid reader and use the library a lot, so I was excited to try the app. The first task it made me do was to select my local library branch from a list.

That doesn't sound like a hard task, except for two things: one, there are 456 local libraries to choose from, and two, the list did not appear to be in any particular order. So even though I knew the official name for my library branch I couldn't find it on the list. After scrolling through 10 screens' worth of library names, the screen in **Figure 66.1** appeared.

Imagine that you walk into a library and ask to borrow a book. The librarian asks you to look at a long list of libraries and choose the one you happen to be standing in from the list. When you don't choose fast enough, he recites the words in the picture above (including the very long field of letters and numbers that you are supposed to remember and then tell to someone else).

This is not what the interaction with a human librarian would be like. This screen is definitely not following person-to-person communication expectations.



Figure 66.1 This screen does not follow person-to-person communication expectations

Takeaways

- * When you're designing a product, think about the interactions that the person will have with it. Do the interactions follow the rules of a person-to-person interaction?
- * Many usability design guidelines for products are actually guidelines that mimic person-to-person interactions. Follow basic usability guidelines and you'll be more assured of meeting interactive expectations.

There are many ways to communicate: paper and pen, email, face-to-face meetings, telephone, messaging. Some researchers have been interested in whether there are differences in how honest we are based on the medium.

NINETY-TWO PERCENT OF GRADUATE STUDENTS LIED

Charles Naquin (2010) from DePaul University and his colleagues have conducted research on honesty in people when using email versus pen and paper.

In one study, 48 graduate business students were each given \$89 (imaginary money) to divide with their partner; they had to decide whether to tell their partner how much money there was and decide how much of the money to share with their partner. (There wasn't actually a partner; they just thought there was one that they were sending a message to.) One group (24 students) communicated by email, and the other group (the other 24 students) communicated by handwritten note. The group that wrote emails lied about the amount of money (92 percent) more than the group that was writing by hand (63 percent). The email group was also less fair about sharing the money and felt justified in not being honest or fair.

MANAGERS LIE TOO

Lest you think only the students would lie, Naquin and team performed additional studies with managers. One hundred and seventy-seven managers played a group financial game. Participants were assigned to teams of three. Each member of the team had a chance to play the role of a manager of a project team who was allocating money for projects. They played with real money, and they were told that the amount of money available would be revealed after the game. Some participants were told to communicate via email and others with paper and pen. The managers who communicated via email lied more, and kept more money for themselves, compared to the managers who communicated with paper and pen.



Harsher ratings on performance reviews

Terri Kurtzberg (2005) and her team did three studies to see whether people gave different performance review ratings if the reviews were done via email versus with pen and paper. In all three studies participants gave more negative appraisals of their peers when communicating via email than when using pen and paper.

PEOPLE LIE MOST ON THE TELEPHONE

At this point you might be thinking that emails are the worst in terms of lying. They're not. Jeff Hancock (2004) conducted a diary study. Using self-reporting, participants admitted to lying most on the phone and least in email, with face-to-face and messaging interactions equal and in the middle of the other techniques.



The moral disengagement theory

Albert Bandura, a social psychologist from Stanford University, hypothesized that people can and will become unethical as they distance themselves from the bad consequences of their actions. He called this the moral disengagement theory (Bandura, 1999). In discussing the results of his studies about email, Charles Naquin (2010) and his team suggest that email causes that distancing because it is viewed as less permanent and because people feel less trust and rapport.



How far did you go lying in one email?

Jeff Hancock (2008) reports that liars write more words (28 percent more) than people who are telling the truth, and that liars use fewer first-person references (I, me) and more second- and third-person references (you, he, she, they). Interestingly, most people in the research were not very good at figuring out when they were being lied to.

DO PEOPLE LIE IN TEXT MESSAGES?

Madeline Smith's research (2014) on lies in text messages shows that the rate for lying in text messages is around 76 percent. She found that in texts, the lies are mainly about oneself (for example, saying you can't meet for lunch with someone because you are working, when actually you aren't working but you just don't want to go to lunch with that person). She found that almost everyone lies while texting, but about 5 percent of people lie a lot—almost three times more than most.

Takeaways

- * Most people lie frequently, and a small number of people lie a lot.
- * People lie most on the phone and least with pen and paper.
- * People are more negative toward others via email than with pen and paper.
- * If you're designing surveys via email, realize that people are likely to be more negative than they would be using pen and paper.
- * If you are conducting a survey or getting audience feedback, be aware that telephone surveys will not get you as accurate a response as email or pen-and-paper surveys will.
- * Customer or audience feedback is most accurate when gathered in person.

SPEAKERS' BRAINS AND LISTENERS' BRAINS SYNC UP DURING COMMUNICATION

When you listen to someone talking, your brain starts working in sync with the speaker. Greg Stephens (2010) and his team put participants in his research study in an fMRI machine and had them record or listen to recordings of other people talking. He found that as people listen to someone else talk, the brain patterns of both speaker and listener start to couple, or mirror each other. There's a slight delay, which corresponds to the time it takes for the communication to occur. Several different brain areas were synced. He compared this with having people listen to someone talk in a language they did not understand. In that case the brains do not sync up.

SYNCING PLUS ANTICIPATION EQUALS UNDERSTANDING

In Stephens's study, the more the brains were synced up, the more the listener understood the ideas and message from the speaker. And by watching what parts of the brain were lighting up, Stephens could see that the parts of the brain that have to do with prediction and anticipation were active. The more active they were, the more successful the communication was. Stephens noted that the parts of the brain that have to do with social interaction were also synced, including areas known to be involved in processing social information crucial for successful communication, such as the capacity to discern the beliefs, desires, and goals of others. Stephens also hypothesizes that mirror neurons are involved in the speaker-listener brain syncing.

Takeaways

- ✧ Listening to someone talk creates a special brain syncing that helps people understand what is being said.
- ✧ Presenting information through audio or video, where people can hear someone talking, is an especially powerful way to help people understand the message.
- ✧ Don't just rely on reading if you want people to understand information clearly.

Your uncle Arden invites you over to watch the World Cup and tells you to bring some friends. When you get there, you see several people you know (relatives and friends of relatives) and some you don't know. It's a lively bunch, and over food and the game on TV, lots of topics are covered, including soccer and politics. As you would expect, you have similar opinions to some of your friends and relatives, and you disagree with some of them. You actually have more in common, in terms of soccer and politics, with some of the strangers you just met today than you have with some of your friends and relatives. When it comes to the people in the room, you have essentially four possible connections, as shown in **Figure 69.1**.

Similar	Friends and relatives who I have a lot in common with	Strangers who I have a lot in common with
	Friends and relatives who I don't have a lot in common with	Strangers who I don't have a lot in common with
Not Similar		

FIGURE 69.1 The four possible connections with the people at the World Cup party

The question that Fenna Krienen (2010) conducted research on is this: Does your brain react differently to these four combinations? Do you make judgments about people based on how similar they are to you? Or is it more important that they be close to you, either a close friend or a relative? And if there are differences, will they show up on fMRI brain scans? When you think about people who you don't know but feel similar to, do the same brain regions light up as though you were connected to them through kinship or previous friendship?

Krienen and her team tested these theories. They found that when people answered questions about friends, whether or not they felt they were similar to their friends, the medial prefrontal cortex (MPFC) was active. The MPFC is the part of the brain that perceives value and regulates social behavior. When people thought about others that they didn't know but had common interests with, the MPFC was not active.

Takeaways

- * All social media are not alike. It may be important to distinguish between social media for friends and relatives and social media for people you're not already connected to.
- * People are "programmed" to pay special attention to friends and relatives. Social media channels that include your friends and relatives will be more motivating and garner more loyalty than those for acquaintances or other purposes.

How many times a day do you hear someone laugh? Laughter is so ubiquitous that you don't even stop to think about what it is and why people do it.

There's less research on laughter than you might think. But a few people have spent time researching it. Robert Provine is one of the few neuroscientists studying laughter. He has concluded that laughter is an instinctual (not learned) behavior that creates social bonding.

Provine (2001) has spent many hours observing when and why people laugh. He and his team observed 1200 people spontaneously laughing in different locations. They took notes on gender, situation, speaker, listener, and context. Here's a summary of what they found:

- ★ Laughter is universal. All humans in all cultures laugh.
- ★ Laughter is unconscious. People can't actually laugh on command—it will be fake laughter if they try.
- ★ Laughter is for social communication. People rarely laugh when they're alone. They laugh 30 times more often when they're with others.
- ★ Laughter is contagious. People will smile and then start laughing as they hear others laugh.
- ★ Laughter appears early in babies, at about four months old.
- ★ Laughter isn't about humor. Provine studied over 2000 cases of naturally occurring laughter, and most of it did not happen as a result of humor, such as telling jokes. Most laughter followed statements such as "Hey, John, where ya been?" or "Here comes Mary" or "How did you do on the test?" Laughter after these types of statements bonds people together socially. Only 20 percent of laughter is from jokes.
- ★ People rarely laugh in the middle of a sentence. It's usually at the end.
- ★ The person who is speaking laughs twice as much as the person who is listening.
- ★ Women laugh more than twice as much as men.
- ★ Laughter denotes social status. The higher up on the hierarchy you are in a group, the less you will laugh.

TICKLE LAUGHTER VS. JOY LAUGHTER

Diana Szameitat (2010) and her team studied laughter produced from tickling versus laughter from other sources. They had people listen to recordings of people laughing while being tickled versus those laughing without tickling. When people listened to regular laughter without tickling, they showed activity in the medial frontal cortex of the brain. This is a region that is usually associated with social and emotional processing. When people listened to laughter during tickling, they showed activity in the same region, but also activity in the secondary auditory cortex. Tickle laughter sounds different.

The researchers think that laughter might have started in animals as a reflex-like reaction to touch and then become differentiated over time through various animals and species.

LAUGHTER AND TECHNOLOGY

One of the problems of communicating asynchronously (via email or messaging) is the lack of hearing others laugh. If most of our communications with others, whether friends or co-workers, is happening through a text medium, then we don't hear the laughter of others and the bonds are less formed.

In order for a group to form a close bond and stay closely bonded you will need to build in opportunities to meet in person or at least to have audio calls where you can hear each other laugh.



It's not just a people thing. Chimps tickle each other and even laugh when another chimp pretends to tickle them. Jaak Panksepp studies rats that laugh when he tickles them. You can watch a video on YouTube showing Panksepp tickling rats: <http://bit.ly/gBYCKt>.

Takeaways

- * Many online interactions are asynchronous (email, messaging) and therefore don't afford a lot of opportunity for social bonding through laughing.
- * Look for opportunities to at least have synchronous audio communication (phone calls, teleconferences) so that periodically you can laugh together. This will bond the relationship(s).
- * You don't necessarily need humor or jokes to get people to laugh. Normal conversation and interactions will produce more laughter than intentional use of humor or jokes.
- * If you want people to laugh, then laugh yourself. Laughter is contagious.

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PEOPLE CAN TELL WHEN A SMILE IS REAL OR FAKE MORE ACCURATELY WITH VIDEO

Research on smiling started as far back as the mid-1800s. A French doctor named Guillaume Duchenne used electrical currents with research subjects. He would stimulate certain facial muscles and then take pictures of the expressions that people made (**Figure 71.1**). This was painful, and many of the pictures look like the people are in pain.



FIGURE 71.1 Guillaume Duchenne took photos of people whose facial muscles were electrically stimulated

REAL OR FAKE?

Duchenne identified two different types of smiles. Some smiles involve contraction of both the zygomatic major muscle (which raises the corners of the mouth) and the orbicularis oculi muscle (which raises the cheeks and makes the eyes crinkle). Smiles that contract both of these muscle groups are called Duchenne smiles. In a non-Duchenne smile only the zygomatic major muscle contracts; in other words, the mouth turns up, but the eyes don't crinkle.

After Duchenne, several researchers used these ideas to research smiling. For years it was believed that Duchenne smiles were the ones that were seen as genuine and that it was not possible to “fake” a smile, because up to 80 percent of people can’t consciously control the muscles around the eyes that make them crinkle. Why all the interest in whether a smile is real or fake? Because people are quicker to trust and like other people who are showing what are believed to be genuine emotions rather than fake or contrived ones.

QUESTIONING THE 80 PERCENT FIGURE

Eva Krumbhuber and Antony Manstead (2009) decided to research whether it was true that most people couldn’t create a fake smile that looks real. They found the opposite of what was previously believed. In their research, when photos were taken of people pretending to smile, 83 percent of the people could produce fake smiles that other people thought were real.

They also decided to test videos rather than just photos. What they found was that it was harder to fake a smile in a video, but not because of the crinkly eyes. People could tell real from fake by paying attention to other factors, such as how long they held the smile and whether they saw other emotions besides happiness—for example, a flicker of impatience. The video made it easier to detect a fake smile because it lasted longer and was dynamic, instead of just a snapshot.

Takeaways

- ★ If you are using a video to put across your message, pay attention to smiles. People will be able to determine a fake smile versus a real one better in a video than in a photo. If they don’t think the smile is real, they’re less likely to trust the person in the video, and that may carry over to your brand or product.
- ★ It is possible to fake a smile and to fake a crinkly-eye smile, but it is easier to fake a smile in a static picture than in a video.
- ★ People can tell whether a smile is real or not by looking for conflicting emotions. They are looking at many parts of the face, not just the eyes.
- ★ If a smile looks real, it will engage the viewer and build trust.

HOW PEOPLE FEEL

People don't just think. They also feel. In addition to understanding your audience's demographics, you need to also understand their psychographics.

Considering how important emotions are in our everyday life, there's not as much research on them as you might think. Scientists studying emotions distinguish them from moods and attitudes:

- ★ Emotions have physiological correlates, are expressed physically (through gestures, facial expressions, and so on), result from a specific event, and often lead to an action.
- ★ Moods last longer than emotions, perhaps a day or two. They may not be expressed physically and may not come from a specific event.
- ★ Attitudes have a more cognitive, conscious brain component.
- ★ Joseph LeDoux (2000) has shown that certain parts of the brain activate when people are feeling certain emotions.

THE CONTROVERSY: ARE FACIAL EXPRESSIONS UNIVERSAL?

Paul Ekman has written the books *Emotions Revealed: Recognizing Faces and Feelings to Improve Communication and Emotional Life* (2007) and *Telling Lies: Clues to Deceit in the Marketplace, Politics, and Marriage* (2009) and was a consultant to the Fox TV series *Lie to Me*. He has identified seven emotions that he says are universal (**Figure 72.1**). Ekman believes that these emotions are recognized by everyone, regardless of culture or geography.

Not everyone agrees with Ekman's conclusions about the universality of emotions. Rachel Jack's research in 2012 showed possible differences in the recognition of emotions in facial expressions depending on geographic and cultural factors. Western participants in her research recognized the seven basic emotions formulated by Ekman, but participants in the research from East Asia did not recognize all of those emotions in the same way. Jack argues that some emotional expressions seem to be mediated by culture.

Other researchers (Sauter and Eisner, 2013) disagree with the conclusions of Jack's research.



FIGURE 72.1 Paul Ekman's seven universal emotions

CULTURAL DIFFERENCES IN HIGH EMOTIONAL AROUSAL VS. LOW EMOTIONAL AROUSAL

Nangyeon Lim's research (2016) posits a different conclusion: Western cultures express and recognize emotions that have a higher level of emotional arousal—for example, fear, anger, alarm, delight, frustration, happiness, and tension. Eastern cultures express and recognize emotions with a lower level of emotional arousal (for example, ease, boredom, contentment, misery, relaxation, satisfaction, and sleepiness, among others).

So for now, there is not firm agreement about the universality of basic emotions.

Takeaways

- * If you are designing for Western audiences, you can assume that your audience will recognize Ekman's seven basic emotions of joy, sadness, contempt, fear, disgust, surprise, and anger. You can also assume that high-emotion expressions will be more attention getting.
- * If you are designing for non-Western cultures, then you may want to use images and facial expressions that have less emotional arousal.
- * You may want to research which emotions drive your particular target audience. In addition to basic demographic information, identify and document psychographics; for example, what emotions are motivating or will motivate different segments of your target audience?

POSITIVE FEELINGS ABOUT A GROUP CAN LEAD TO GROUPTHINK

You are part of a design team that works well together. The team has really gelled and you feel great about being part of such a productive group that gets along.

All good, right? Well maybe not. In her paper describing the research on emotions and decision-making, Jennifer Lerner (2015) discusses how being part of a team or group that is functioning well can actually result in the group making poor decisions.

It is true that people like to be part of group that has a “shared sense of reality.” The downside, though, is that people who are part of a well-working group tend to want to minimize conflict. They don’t want to do anything or say anything that may disrupt the good feelings and harmony.

This means that, sometimes, important issues are not dealt with, and difficult decisions are not made—or, if decisions are dealt with, those decisions might not be best in the long run. It might have simply been a decision made to keep the group together and strong.

Takeaways

- * The more cohesive your team is, the more you need to watch out for “groupthink.”
- * Establish debate and disagreement as social norms for the group. Use the power of the group to create a new social norm that allows, indeed encourages, disagreement and debate.
- * Submit group decisions to an outsider’s review. Let someone outside the group review the group decisions.

STORIES AND ANECDOTES PERSUADE MORE THAN DATA ALONE

Let's say you have to make a presentation to the department heads at work about your latest conversations with your customers. You interviewed 25 customers and surveyed another 100 and have lots of important data to share. Your first thought might be to present a summary of the data in a numerical/statistical/data-driven format, for example:

- ★ 75 percent of the customers we interviewed...
- ★ Only 15 percent of the customers responding to the survey indicated...

But this data-based approach will be less persuasive than anecdotes. You may want to include the data, but your presentation will be more powerful if you focus on one or more anecdotes; for example, "Mary M. from San Francisco shared the following story about how she uses our product...," and then go on to tell Mary's story.

One of the reasons why anecdotes are more powerful than data is that anecdotes are in story form. When you provide information in story form, the information is processed differently. Different areas of the brain react to stories rather than data alone. Stories evoke feelings and emotions, which causes the information to be remembered better and longer.

Takeaways

- ★ Information is processed more deeply and remembered longer if it is in story form.
- ★ Look for ways to provide a message that will evoke emotions and empathy.
- ★ Use anecdotes and stories in addition to data.

Botox is a popular cosmetic product used to reduce facial wrinkles. It's injected into various muscles (for instance, in the face) and paralyzes them, thereby causing the wrinkles to relax. It's been known for some time that a side effect of Botox treatments is that people can't fully express emotions (for example, they can't move the muscles that show they're angry or even happy). New research shows that another side effect of the injections is that people can't *feel* emotions either. If you can't move your muscles to make a facial expression, you can't feel the emotion that goes with the expression. If you've recently received a Botox injection and you go to a sad movie, you won't feel sad because you won't be able to move the facial muscles that go with feeling sad. Moving muscles and feeling emotions are linked.

Joshua Davis (2010) from Barnard College and his team tested this idea. They injected people with either Botox or Restylane. Restylane is a substance that, when injected, fills out sagging skin but does not limit muscle movement like Botox does. Before and after injecting the participants, they showed them emotionally charged videos. The Botox group showed much less emotional reaction to the videos after the injections.

David Havas (2010) instructed people to contract the specific muscles used in smiling. When the participants contracted those muscles, they had a hard time generating a feeling of anger. When he instructed them to contract the muscles that are used to frown, the participants had a hard time feeling friendly or happy.

NO EMOTIONS = NO DECISIONS

Antoine Bechara (1999) studied the relationship between emotions and decisions. In his research he found that people who had damage to the parts of the brain involved in feeling emotions were also unable to make decisions.



The brain mirrors emotions too

When you observe someone who is feeling a certain emotion, the same parts of your brain are active as in the brain of the person experiencing the emotion. An example is the research of Nicola Canessa and her team (2009), who found that fMRI scans show this effect with the emotion of regret. Participants watched someone perform a gambling task. When the person doing the gambling made a decision that caused them to lose money, they felt regret, and certain parts of their brain were active during that feeling. When participants in the study watched people doing the gambling task, the same regions in the brain were activated.

Takeaways

- * You may need to consider the emotions you're generating as people interact with your product. For example, if someone reads a sad story and is frowning, this may put them in a sad mood that might affect the next action they take.
- * Watch out for unintended facial expressions that may change how people feel about your product. For example, if the font on your website is very small and people are squinting and frowning to read it, that may actually prevent them from feeling happy or friendly, and that may affect an action you want them to take.
- * If you want people to make a decision and take an action (for example, to register for your newsletter or click a Buy button), you need to show them information, images, or a video that triggers an emotion. They will be more likely to decide if they have an emotional experience.

In the chapter “How People Focus Their Attention” I talk about the role of the “old brain” in scanning the environment for anything that could be dangerous. This also means that the unconscious old brain is looking for anything new or novel.

CRAVING THE UNEXPECTED

Research by Gregory Berns (2001) shows that the human brain not only looks for the unexpected but actually craves the unexpected.

Berns used a computer-controlled device to squirt either water or fruit juice into people's mouths while their brains were being scanned by an fMRI device. Sometimes the participants could predict when they were going to get a squirt, but other times it was unpredictable. The researchers thought that they would see activity based on what people liked. For example, if a participant liked juice, then there would be activity in the nucleus accumbens, the part of the brain that is active when people experience pleasurable events.

However, that's not what happened. The nucleus accumbens was most active when the squirt was unexpected. It was the surprise that showed activity, not the preferred liquid.



Nice surprises vs. unpleasant surprises

Not all surprises are equal. If, when you come home and turn on the light, your friends yell “Surprise!” because it's your surprise birthday party, that's a very different kind of surprise from finding a burglar in your home.

Marina Belova and her team (2007) researched whether the brain processes these two different kinds of surprises in different locations.

The researchers worked with monkeys and the amygdala, a part of the brain where emotions are processed. In their research they recorded the electrical activity of neurons in the amygdala. They used a drink of water (pleasant) versus a puff of air to the face (which the monkeys do not like).

They found that some neurons responded to the water and others to the puff of air, but a specific neuron did not respond to both.

Takeaways

- * If you want to grab attention, design something that is new and novel.
- * Something unexpected not only gets attention but can also be pleasurable.
- * Although a certain amount of consistency (at a website, for example) is a good thing when people are trying to complete a task, providing novel and unexpected content and interactions is good when you want people to try something new or when you want them to come back to see what's new.



PEOPLE ARE HAPPIER WHEN THEY'RE BUSY

Consider this scenario: You've just landed at an airport and you have to walk to the baggage claim to pick up your luggage. It takes you 12 minutes to walk there. When you arrive, your luggage is coming onto the carousel. How impatient do you feel?

Contrast that with this scenario: You've just landed at an airport, and the walk to the luggage carousel takes 2 minutes. Then you stand around waiting 10 minutes for your luggage to appear. How impatient do you feel now?

In both cases it took you 12 minutes to pick up your luggage, but chances are you are much more impatient, and much unhappier, in the second scenario, where you have to stand around and wait.

PEOPLE NEED AN EXCUSE

Research by Christopher Hsee (2010) and his colleagues shows that people are happier when they're busy. This is somewhat of a paradox. In the "What Motivates People" chapter, I wrote that we are lazy. Unless people have a reason for being active, they'll choose to do nothing, thereby conserving energy. However, doing nothing makes people impatient and unhappy.

Hsee's team gave participants a choice: delivering a completed questionnaire to a location that was a 15-minute round-trip walk away, or delivering it just outside the room and then waiting 15 minutes. Some participants were offered the same snack bar regardless of which activity they chose, and others were offered a different type of snack bar for the two options. (Hsee previously determined that both snack bars were considered equally desirable.)

If the same snack bar was offered at both locations, then most (68 percent) of the participants chose to deliver the questionnaire just outside the room (the "lazy" option). The students' first reaction was to do less work, but when they were given an excuse for walking farther, most of them took the busy option. After the experiment, the students who'd taken the walk reported feeling significantly happier than the idle students. In a second version of the study, the students were assigned to either the "busy" or the "idle" option (in other words, they did not choose). The busier students, again, reported higher happiness scores.

In the next round of research, Hsee asked students to study a bracelet. Then he gave them the option of either spending 15 minutes waiting with nothing to do (they thought they were waiting for the next part of the experiment) or spending the same time taking the bracelet apart and then rebuilding it while waiting. Some of the participants were

given the option of rebuilding it into its original configuration, and others were given the option to reassemble the bracelet into a different design.

Participants who had the option of rebuilding the bracelet as it had been before preferred to just sit idly. But the participants who were told they could reassemble the bracelet into a new design preferred to work on the bracelet rather than sit idle. As before, those who spent the 15 minutes busy with the bracelet reported feeling happier than those who sat idle.

Takeaways

- * People don't like to be idle.
- * People will do a task rather than be idle, but the task has to be seen as worthwhile. If people perceive it to be busywork, then they prefer to stay idle.
- * People who are busy are happier.

Walk into any hotel, house, office building, museum, art gallery, or other place where there are paintings or photographs hanging on the wall, and chances are that you'll see a picture that looks something like **Figure 78.1**.



FIGURE 78.1 Pastoral scenes are part of our evolution

According to Denis Dutton, a philosopher and the author of *The Art Instinct: Beauty, Pleasure, and Human Evolution*, you'll often see these types of images because we're drawn to them due to our evolution during the Pleistocene era. (See Dutton's TED talk at <http://bit.ly/clj9uo>.) Dutton notes that typical landscape scenes include hills, water, trees (good for hiding in if a predator comes by), birds, animals, and a path moving through the scene. This is an ideal landscape for humans, containing protection, water, and food. Dutton's theory about beauty is that we have evolved to feel a need for certain types of beauty in our lives and that this pull toward things such as these landscapes has helped us survive as a species. He notes that all cultures value artwork that has these scenes, even people who have never lived in a geographical location that looks like this.

PASTORAL SCENES PROVIDE “ATTENTION RESTORATION”

Mark Berman (2008) and a team of researchers first had participants perform the *backward digit-span task*, which measures a person's capacity to focus attention. Next, participants were asked to do a task that would wear out their voluntary attention. After that, some participants were asked to walk through downtown Ann Arbor, Michigan, and some were asked to walk through the city's arboretum. The arboretum has trees and wide lawns (that is, it's a pastoral environment). Following the walk, the participants did the backward digit-span task again. Scores were higher for the people who had walked through the arboretum. Stephen Kaplan (one of the researchers) calls this “attention restoration therapy.”

Roger Ulrich (1984) found that patients whose hospital window overlooked scenes of nature had shorter stays and needed less pain medication compared to patients whose rooms looked onto a brick wall.

Peter Kahn (2009) and his team tested nature scenes in the workplace. One group of participants worked in an office where they sat near a glass window that overlooked a nature scene. A second group saw a similar scene, but not out the window; instead, they watched a video feed from a nature area outside. A third group sat near an empty wall. The researchers kept measurements of the participants' heart rates to monitor their stress levels.

People who saw the video scene said that they felt better, but their heart rates were actually no different from those who sat next to the wall. People in front of the glass window actually had healthier heart rate measurements and were better able to recover from stress.

Takeaways

- * People like pastoral scenes. If you're looking for a nature scene to use at a website, try to pick one with pastoral elements.
- * People will be drawn to, like, and feel happier looking at a pastoral scene online, but it won't have the same positive health effects as seeing the actual scene out a window or being able to walk through the pastoral setting.

PEOPLE USE “LOOK AND FEEL” AS THEIR FIRST INDICATOR OF TRUST

There isn't much actual research on trust and website design. There are many opinions, but not necessarily much real data. Research by Elizabeth Sillence (2004) and her team provides some solid data, at least with regard to health websites.

Sillence researched how people decide which health websites to trust. Participants in the study were all patients with hypertension. (In previous research, Sillence used the topic of menopause and found similar results.) In this study participants used websites to look for information about hypertension.

When participants in the study rejected a health website as not being trustworthy, 83 percent of their comments were related to design factors, such as an unfavorable first impression of the look and feel, navigation, color, text size, or name of the website.

When participants mentioned the features that were relevant to their decision that a website was trustworthy, 74 percent referenced the content of the site rather than design factors. They preferred sites owned by well-known and respected organizations and those that had advice written by medical experts, with information that was specific to them and that they felt was written for people like themselves.



Trust is the biggest predictor of happiness

If you want to know who is happiest, then figure out who feels the most trust. In his book *The Geography of Bliss* (2009), Eric Weiner travels the world investigating which countries have the happiest people and why. Here is some of what he discovered and wrote about:

- ★ Extroverts are happier than introverts.
- ★ Optimists are happier than pessimists.
- ★ Married people are happier than singles, but people with children are the same as childless couples.
- ★ Republicans are happier than Democrats.
- ★ People who go to church are happier than those who don't.
- ★ People with college degrees are happier than those without, but people with advanced degrees are less happy.

- ★ People with an active sex life are happier than those without.
- ★ Women and men are equally happy, but women have a wider emotional range.
- ★ Having an affair will make you happy, but not if your spouse finds out and leaves you.
- ★ People are least happy when they are commuting to work.
- ★ Busy people are happier than those with too little to do.
- ★ Wealthy people are happier than poor ones, but just by a little bit.
- ★ Iceland and Denmark are some of the happiest places.
- ★ Seventy percent of the variability in happiness can be attributed to relationships with people.

Interestingly, among all the variables, the best predictor of happiness is whether people have trust (for example, trust in their country and trust in their government).

Takeaways

- ★ People make quick decisions about what is not trustworthy.
- ★ Design factors such as color, font, layout, and navigation are critical in making it through the first “trust rejection” phase.
- ★ If a website makes it through the first rejection cut, then content and credibility become the determining factors as to whether the person trusts the site.

LISTENING TO MUSIC RELEASES DOPAMINE IN THE BRAIN

Have you ever listened to a piece of music and experienced intense pleasure, even chills? Valorie Salimpoor (2011) and her team conducted research that shows that listening to music can release the neurotransmitter dopamine. Even anticipating music can release dopamine.

The researchers used positron emission tomography scans, fMRI, and psychophysiological measures such as heart rate to measure reactions while people listened to music. The participants provided music that they said gave them intense pleasure and chills. The range of music included classical, folk, jazz, electronica, rock, pop, tango, and more.

PLEASURE VS. ANTICIPATED PLEASURE

Salimpoor's team saw the same pattern of brain and body activity when people were listening to their music that they saw when people feel euphoria and craving while getting a reward. The experience of pleasure corresponded with dopamine release in one part of the brain (the striatal dopaminergic system). When people were anticipating a pleasurable part of the music, there was a dopamine release in a different part of the brain (the nucleus accumbens).

Takeaways

- * Music can be intensely pleasurable.
- * People have favorite music that induces euphoria.
- * Music is very individualized. What induces euphoria in one person may have no effect for someone else.
- * Anticipating the pleasurable parts of music activates different areas of the brain and different neurotransmitters than actually listening to and experiencing the music.
- * Allowing people to use or add their own music to a website, product, design, or activity is a powerful way to engage them. It also makes it more likely that they will want to come back and engage again.
- * Including video with music at a website can be engaging as well. Not only is the video attention getting, it is a reason to include music.

THE MORE DIFFICULT SOMETHING IS TO ACHIEVE, THE MORE PEOPLE LIKE IT

You've heard about fraternities that have difficult initiation rituals to get in. The idea is that if an organization is hard to get into, then the people in it like it even more than if entry were not so difficult.

The first research on this initiation effect was done by Elliot Aronson at Stanford University in 1959. Aronson set up three initiation scenarios (severe, medium, and mild, although the severe was not really that severe) and randomly assigned people to the conditions. He did indeed find that the more difficult the initiation, the more people liked the group.

COGNITIVE DISSONANCE THEORY

Leon Festinger (1956) was the social psychologist who developed the idea of *cognitive dissonance theory*. Aronson uses this theory to explain why people like groups that they had to endure hardship to join. People go through this painful experience only to find themselves part of a group that is not all that exciting or interesting. But that sets up a conflict (dissonance) in their thought process—if it's boring and uninteresting, why did I submit myself to pain and hardship? To reduce the dissonance, you decide that the group is really important and worthwhile. Then it makes sense that you were willing to go through the pain.

SCARCITY AND EXCLUSIVITY

In addition to the theory of cognitive dissonance to explain this phenomenon, I think scarcity comes into play. If it's difficult to join the group, then not very many people can do it. If I might not be able to make it in, then I would lose out. So if I went through a lot of pain, it must be good.

Takeaways

- * I'm not suggesting that you make your website, product, or software application hard to use so that people will feel pain and therefore like it more, although that is probably accurate.
- * If you want people to join your online community, you might find that people use it and value it more when there are steps that have to be taken to join. Filling out an application, meeting certain criteria, being invited by others—all of these can be seen as barriers to entry, but they may also mean that the people who do join care more about the group.

Here's a thought experiment. On a scale of 1 to 10, with 1 being the lowest and 10 being the highest, rate how happy you are right now. Write that number down. Now imagine that you win the lottery today. You now have more money than you ever thought you would. You have millions and millions of dollars. What do you think your happiness rating would be at the end of today? Write that number down. What do you think your happiness rating will be two years from now if you win millions and millions in the lottery today?

PEOPLE ARE POOR PREDICTORS

In his book *Stumbling on Happiness* (2007), Daniel Gilbert discusses the research he and others have conducted on predicting or estimating emotional reactions to events. He has found that people greatly overestimate their own reactions to both pleasant and unpleasant events in their lives. Whether it's predicting how they'll respond to a negative event (such as losing a job, having an accident, or the death of a loved one) or a positive one (such as coming into a lot of money, landing a dream job, or finding the perfect mate), everyone tends to overestimate their reaction. If the event is negative, they predict that they'll be very upset and devastated for a long time. If the event is positive, they predict that they'll be deliriously happy for a long time.

A BUILT-IN REGULATOR

What really happens is that you have a built-in regulator. Whether negative events happen or positive events happen, you stay at about the same level of happiness most of the time. Some people are generally happier or unhappier than others, and this level of happiness stays constant no matter what happens to them. This means that people are not very accurate in their predictions of future happiness.

Takeaways

- ★ People may prefer one thing over another or think that they will, but their reaction—be it positive or negative—will probably not be as strong as they imagine it.
- ★ Be careful of believing customers or users who tell you that making a particular change to a product or design will make them much happier with it or cause them to never use it again. They are likely overestimating their reactions.

PEOPLE FEEL MORE POSITIVE BEFORE AND AFTER AN EVENT THAN DURING IT

Imagine you're planning a trip with your sister to the Cayman Islands several months from now. The two of you talk on the phone at least once a week, discuss the snorkeling you plan to do, and talk about restaurants that are close to the place you are staying. You look forward to the trip for a long time.

Contrast that with the actual experience of the trip, and you may find that the anticipation was better than the trip. In fact, Terence Mitchell (1997) and his team conducted research on just such a situation. They studied people who were taking a trip to Europe, a short trip over the Thanksgiving holiday weekend, or a three-week bicycle tour of California.

Before the event people looked forward to the trip with positive emotions, but during the trip their ratings of the trip were not that positive. The little disappointments that always occur while traveling colored their emotional landscape to the point that they felt less positive about the trip in general. Interestingly, a few days after the trip, the memories became rosy again.



How to have a great vacation and great memories

While we're on the subject of vacations, here's some interesting information from a variety of research that can help you get the most enjoyment out of your vacation:

- ★ Several short vacations are better than one long one.
- ★ You will remember in long-term memory what happens at the end of the vacation more than what happened at the beginning or the middle of the vacation.
- ★ Having an intense peak experience makes you more likely to remember the trip positively, even if the intense experience wasn't necessarily positive.
- ★ Interrupting a trip makes you enjoy the uninterrupted part even more.

Takeaways

- * If you're designing an interface where people are planning something in the future (winning the lottery, going on a trip, arranging a business event, building a house), they'll have more positive feelings about the experience the longer you can draw out the planning phase.
- * If you measure satisfaction or other feelings, realize that you'll get more positive ratings when you ask people a few days after the interaction than when you ask them while they're interacting with the product or website.
- * Alternatively, you'll get better, more realistic data when you ask them during or right after the interaction rather than asking their opinion several days or weeks later.

It's Friday afternoon and your boss calls you in to say that he's not happy with your latest project report. This is the project that you repeatedly told him was in trouble and for which you asked that more staff be assigned. You feel all your warnings were ignored. Now he's telling you that this work will reflect badly on you, and you may even lose your job. On the way home you stop at the grocery store. You are sad and scared. Will you buy the cereal you always buy, or will you try something new?

PEOPLE WANT WHAT'S FAMILIAR

According to research by Marieke De Vries (2010) of Radboud University Nijmegen, in the Netherlands, you will buy the familiar brand. Research shows that people want what is familiar when they are sad or scared. They are willing to try something new and different when they're in a happy mood and not as sensitive to what is familiar.

THE DESIRE FOR THE FAMILIAR IS RELATED TO THE FEAR OF LOSS

This craving for the familiar and a preference for familiar brands is probably tied to the basic fear of loss. In my book *Neuro Web Design: What Makes Them Click?* I talk about the fear of loss. When people are sad or scared, the old brain and the mid-brain (where emotions are processed) are on alert. They have to protect themselves. And a quick way to be safe is to go with what you know. A strong brand is familiar. A strong logo is familiar. When people are sad or scared, they'll go for a brand and logo they know.



It's easy to change someone's mood

It turns out that it is remarkably easy to affect people's moods, especially in the short term (for instance, long enough for them to make a purchase at a website). In Marieke De Vries's research, participants watched video clips of the Muppets (puppets from Sesame Street) to instigate a good mood and clips from the movie *Schindler's List* (a movie about Nazis and concentration camps in World War II) to instigate a bad mood. People reported their mood as significantly elevated after the Muppets and significantly lowered after *Schindler's List*. This mood change then affected their actions in the rest of the research study.

Takeaways

- * Brands are a shortcut. If someone has had a positive experience with a brand in the past, then that brand is a signal of safety to the old brain.
- * Brands are just as important, or even more important, online. In the absence of being able to see and touch the actual product, the brand becomes the surrogate for the experience. This means that brands have a lot of power when people are making an online purchase.
- * Messages of fear or loss may be more persuasive if your brand is an established one.
- * Messages of fun and happiness may be more persuasive if your brand is a new one.

PEOPLE MAKE MISTAKES

To err is human, to forgive divine.

—ALEXANDER POPE

People make mistakes. It's impossible to build a system that is impervious to human error. This chapter is all about the errors that people make.

PEOPLE WILL ALWAYS MAKE MISTAKES; THERE IS NO FAIL-SAFE PRODUCT

I collect computer error messages. It's kind of a hobby. Some of them date back to the old character-based computer screens. Most of them weren't trying to be humorous; they were written by computer programmers who were trying to explain what was going wrong. But many of them end up being quite funny, and some of them intentionally so. My favorite was from a company in Texas. When there was a "fatal" error, meaning the system was going to crash, a message came up that said, "Shut 'er down, Henry, she's spewin' up mud!"

ASSUME THAT SOMETHING WILL GO WRONG

The reality is that something always goes wrong: a user makes a mistake when entering data, a company releases software that has too many errors, or a designer develops something that is unusable because he or she doesn't understand what the user needs to do. Everyone makes mistakes.

It is very difficult to create a system that is free of all errors and that guarantees that people won't make mistakes. In fact it's impossible. The more costly the errors are, the more you need to avoid them. The more you need to avoid them, the more expensive it is to design the system. If it's critical that people not make mistakes (for example, if you're designing a nuclear power plant, an oil rig, or a medical device), then be prepared. You'll have to test two or three times more than usual, and you'll have to train two or three times longer. It's expensive to design a fail-safe system. And you will never fully succeed.

THE BEST ERROR MESSAGE IS NO ERROR MESSAGE

Error messages are probably the part of a device or software program that gets the least amount of time and energy, and maybe that is appropriate. After all, *the best error message is no error message* (meaning that the system is designed so that no one makes errors). But when something goes wrong, it's important that people know what to do about it.

How to write an error message

Assuming that an error will occur and that you'll need to inform the person using your design, make sure that your error message does the following:

- ★ Tells the person what he or she did
- ★ Explains the problem
- ★ Instructs the person how to correct it
- ★ Is written in plain language using active, not passive, voice
- ★ Shows an example, if appropriate

Here is an example of a poor error message:

#402: Before the invoice can be paid it is necessary that the invoice payment be later than the invoice create date.

Say instead, "You entered an invoice payment date that is earlier than the invoice create date. Check the dates and reenter so that the invoice payment date is after the invoice create date."

Takeaways

- * Think ahead to the mistakes that people are likely to make. Figure out as much as you can about the kinds of mistakes people are going to make when they use what you've designed. And then change your design before it goes out so that those mistakes won't be made.
- * Create a prototype of your design and get people to use it so you can see what the errors are likely to be. When you do this, make sure the people who are testing the prototype are the same people who will be using it. For example, if the product is designed for nurses in a hospital, don't use your designers down the hall to test for errors. You need to have nurses at a hospital test for errors.
- * Write error messages in plain language and make sure to tell them what they did, why there is an error, and what they should do to fix it. If appropriate, show them an example.

Once I was on a trip and found myself in a hotel room outside Chicago with my 19-year-old daughter moaning in pain. She'd been sick for a week, each day with a new symptom, but that morning everything got worse—her eardrum felt like it was going to burst. Should I cancel my client meeting and take her to an urgent care clinic? Because I was traveling, I was concerned that I was “out of network,” which would mean that I first had to call my insurance provider to find out if there were any “in network” doctors we could go to and still be covered by our plan. The customer service representative told me to go to a particular website and said that any doctor we picked through that site would be considered “in network.”

USING A WEBSITE UNDER STRESS

With my daughter still moaning in the background, I went to the URL I was given on the phone. The first field on the first page had me stumped. The form asked for the type of plan I had. Unsure, I left it at the default, which was Primary. I didn't know what that meant, but I decided to move on to the next field. My daughter was now moaning louder.

I filled in some more fields on the form and clicked the Search button. The screen came back saying I'd made errors. I filled out the fields again, clicked the Search button again, and again was told there were errors.

I went through this process several times. It was time for me to leave for my meeting. What should I do? The more stressed I got, the more trouble I had filling in the form. I gave up and gave my daughter some ibuprofen and a warm cloth for her ear. I turned on the TV, handed her the remote, and went to my client meeting. I took her to a clinic later that day when I could think clearly.

Several days later, when I was back home (and my daughter was feeling better), I brought up the website again. Looking at it then, I decided there were some design and usability issues, but overall, it wasn't that confusing. When I was very stressed, however, the web page was daunting, impossible to use, and not at all intuitive.

THE YERKES-DODSON LAW

Research on stress shows that a little stress (called *arousal* in the field of psychology) can often help you perform a task, because it heightens awareness. Too much stress, however, degrades performance. Two psychologists, Robert Yerkes and John Dodson (1908), first postulated this arousal/performance relationship, and hence it has been called the Yerkes-Dodson law for over a century (**Figure 86.1**).

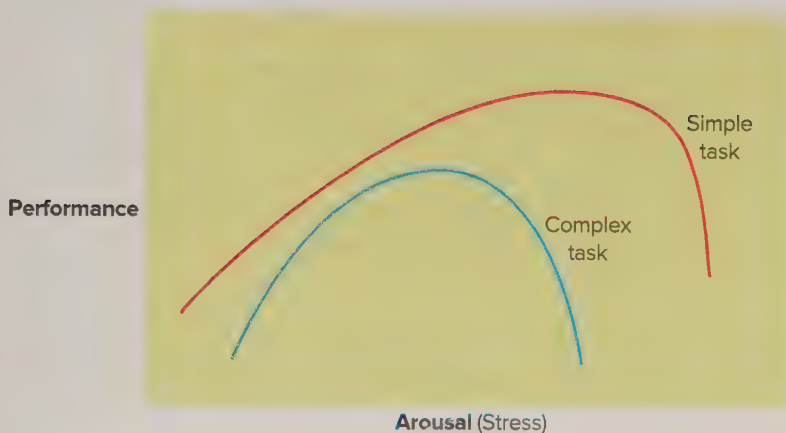


FIGURE 86.1 The Yerkes-Dodson law

Arousal helps up to a point

The Yerkes-Dodson law states that performance increases with physiological or mental arousal, but only up to a point. When levels of arousal become too high, performance decreases. Research shows that the optimal amount of stress/arousal depends on the difficulty of the task. Difficult tasks require less arousal to reach optimal performance and will start to break down if the arousal level is too high. Simpler tasks require more arousal and don't fall off as fast.

Tunnel action sets in

When arousal first goes up there is an energizing effect, as the person is paying attention. But as the stress increases there are negative effects. Attention gets unfocused, people have trouble remembering, problem-solving degrades, and tunnel action sets in. Tunnel action is where you keep doing the same task over and over, even though it isn't working, just like I was doing at the medical website.



Physical evidence of the Yerkes-Dodson law

Sonia Lupien and her team (2007) looked at the relationship of glucocorticoids—hormones related to stress—and memory performance. The researchers found the same upside-down U curve as the Yerkes-Dodson law when tracking the amount of glucocorticoids in the bloodstream.

TASKS ARE MORE STRESSFUL THAN YOU MAY THINK

Don't assume that people will use your product in a stress-free environment. Things that may not seem stressful to you as a designer might be very stressful for the person using your product in the real world. Assembling a toy at midnight on the night before a child's birthday party is stressful. Trying to fill out a form on a screen when a customer is present on the phone or in person is stressful. Most medical situations are stressful. One of my clients had people filling out a form for approving whether medical procedures would be covered by insurance. "It's just a form," was what my client said. But when we interviewed the people using the screens, they said they were very worried they would make a mistake on the form. "What if I make a mistake and someone doesn't get a procedure paid for as a result?" one of them asked. They felt a huge responsibility. It was a stressful situation.



Stressful situations may lead differently to errors

Lindsay St. Claire (2010) and her team found that if men drank caffeinated coffee while completing a stressful task, it impaired their performance. Women, on the other hand, completed the task faster if they had been drinking caffeinated coffee.



Stressful situations lead differently to errors

Yvonne Ulrich-Lai (2010) and her team fed sugar drinks to rats and measured their physiological and behavioral reactions to stress. The sugar drink calmed down the amygdala and reduced stress hormones and the cardiovascular effects of stress. Sexual activity did the same.



When the stakes go up, errors may appear

Alex Rodriguez of the New York Yankees was set to hit his 600th career home run in the summer of 2010. He hit number 599 on July 22, but then spent almost two weeks trying to get one more to make it 600. And this was not the first time he took a long time getting to the number he wanted. Back in 2007 he had the same problem getting from 499 to 500.

This is an example of making mistakes when the stakes are high—a typical problem when dealing with well-learned skills and behaviors. When a skill is practiced and well learned, it's done primarily in an unconscious way. When the stakes go up, you tend to overanalyze. Overanalyzing a well-learned skill works for novices but causes errors for experts.

Takeaways

- * If people are performing a boring task, then you need to raise the level of arousal with sound, colors, or movement.
- * If people are doing a difficult task, then you need to lower the level of arousal by eliminating any distracting elements such as color, sounds, or movement, unless they are directly related to the task at hand.
- * If people are under stress, they won't see things on the screen, and they'll tend to do the same actions over and over, even if they don't work.
- * Do research to find out which situations might be stressful. Make site visits, observe and interview the people who are using your product, determine the level of stress, and then redesign if stress is present.
- * If someone is an expert at a well-learned task, then performance stress may cause errors.

Dimitri van der Linden (2001) and his team conducted research on exploration strategies that people employ when learning how to use computers and electronic devices. Van der Linden's idea is that errors have consequences but that, contrary to popular belief, not all consequences are negative. Although it's possible, and even likely, that making an error has a negative consequence, it's also likely that the error has a positive or a neutral outcome.

Errors with a positive consequence are actions that do not give the desired result but provide the person with information that helps him or her achieve an overall goal.

Errors with a negative consequence are those that result in a dead end, undo a positive consequence, send the person back to the starting point, or result in action that cannot be reversed.

Errors with a neutral consequence are errors that have no effect on task completion.

For example, let's say that you've designed a new tablet device. You give people an early prototype to see how usable the device is. They move the slider bar that they think is the volume control, but instead the screen gets brighter. They've chosen the brightness slider rather than the volume slider. It's a mistake, but now they know how to make the screen brighter. If that's a feature that they also need (and assuming they do eventually find the volume slider), then we could say that the error had a positive consequence.

Now let's say that they're trying to move a file from one folder to another, but they misunderstand the meaning of the button choices and they delete the file instead. That's an error that has negative consequences.

Finally, they try to select a menu option that is not available. They've made an error, but the consequence is neither positive nor negative—it's neutral.

Takeaways

- ✱ Although you don't want people to make lots of errors when using your product, errors will occur.
- ✱ Since you know there will be errors, look for and document them during user testing. Note whether each error consequence is positive, negative, or neutral.
- ✱ After user testing (and even before it), first concentrate on redesigning to minimize or avoid errors with negative consequences.



PEOPLE MAKE PREDICTABLE TYPES OF ERRORS

In addition to thinking about the consequences of errors, as in the van der Linden study described previously, there is another useful error taxonomy. The Morrell (2000) taxonomy classifies two types of errors: performance and motor-control.

PERFORMANCE ERRORS

Performance errors are mistakes you make while you're going through the steps to complete a procedure. Morrell further divides performance errors into commission errors, omission errors, and wrong-action errors.

Commission errors

Let's say you're trying to get a task done, such as turning on the Wi-Fi on your tablet. All you have to do is touch the On/Off control on the screen, but you think that you also need to touch the dropdown menu and select the network. That's an example of a commission error: you took additional steps that were unnecessary.

Omission errors

Now let's say that you're setting up email on your new tablet. You enter your email address and password. What you don't realize is that you have to set up your outgoing and incoming mail settings; you've only set up the outgoing ones. In this case you omitted steps; this is called an omission error.

Wrong-action errors

Let's go back to setting up email. You enter your email and address, but you enter the wrong server name for your email's outgoing server. That is an example of a wrong-action error. You took an action at the appropriate point in the procedure, but it was the wrong action.

MOTOR-CONTROL ERRORS

Motor-control errors are those you make while using the controls of a device. Let's say you're trying to get used to using your fingers to rotate a picture on your tablet. But instead of rotating the picture, you go to the next picture. In this case you've made a motor-control error.

You may have different errors that you want to track as you design or conduct user testing. It's helpful to decide ahead of time which types of errors you think people will make and which are important for you to detect and correct.



The Swiss cheese model of human error

In his book *Human Error* (1990), James Reason writes that errors have a cumulative effect. **Figure 88.1** starts with an error in the organization, which then leads to additional errors in supervision, which leads to even more errors. Each error makes a hole in the system until the end, when you have Swiss cheese (lots of holes), eventually leading to a human error that is a mishap. Reason used nuclear power plant disasters as his example.



FIGURE 88.1 James Reason's Swiss cheese model of human error



The Human Factors Analysis and Classification System (HFACS)

In 2000, Scott Shappell and Douglas Wiegmann wrote a paper on HFACS for the U.S. Office of Aviation Medicine. They worked from James Reason's Swiss cheese model and extended it to propose a system for analyzing and classifying human errors. They focused on preventing errors in aviation, such as pilot error and control tower error. **Figure 88.2** shows an example of the types of errors an HFACS can classify and analyze.

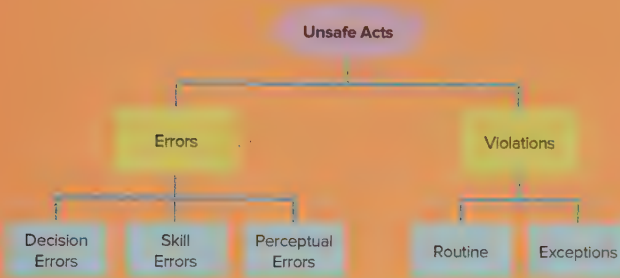


FIGURE 88.2 Types of errors an HFACS classifies

Takeaways

- * People will make different types of errors in learning about and using your product. Before you conduct user testing or user observation, decide which possible errors you are most concerned about.
- * During user testing and observation, collect data on which category of errors people are making. This will help focus your redesign efforts after testing.
- * If you're in a field in which errors are not just annoying or inefficient but may actually result in accidents or loss of human life, then you should use a system like HFACS to analyze and prevent errors.

In addition to classifying the types of errors that people make, you can think about the types of strategies that people use to correct an error. Neung Eun Kang and Wan Chul Yoon (2008) conducted a research study to look at the types of errors that both younger and older adults make when learning how to use new technologies. In their study they identified and tracked different error strategies.

SYSTEMATIC EXPLORATIONS

When people use systematic exploration, they plan out what procedures they'll use to correct the error. For example, let's say that they're trying to figure out how to put a song on a repeat loop. They try one item on a menu and that doesn't work, so they set out to see what each item in the menu does. They start at the first item in the first menu and work their way through all the choices. They are exploring systematically.

TRIAL AND ERROR EXPLORATIONS

In contrast to systematic exploration, trial and error means that the person randomly tries out different actions, menus, icons, and controls.

RIGID EXPLORATIONS

Doing the same action over and over even though it doesn't solve the error is called rigid exploration. For example, let's say someone wants a song to repeat in a loop and they touch an icon on the screen that they think should set the song to loop. But it doesn't work. They then choose the song again and touch the icon again. And they keep repeating this combination of actions even though it doesn't work.



Older adults complete tasks differently than younger adults

Kang and Yoon (2008) found no difference in completion rates for tasks due to age, but older adults (those in their 40s and 50s) used different strategies than younger adults (those in their 20s).

- ★ Older adults took more steps to get the tasks completed, mainly because they made more errors as they went along, and they tended to use more rigid exploration strategies than did younger adults.
- ★ Older adults often failed to receive meaningful hints from their actions and therefore made less progress toward the task goal.
- ★ Older adults showed more motor-control problems.
- ★ Older adults didn't use their past knowledge as much as younger adults did.
- ★ Older adults had a higher level of uncertainty about whether their actions were correct. They felt more time pressure and less satisfaction.
- ★ Older adults adopted more trial-and-error strategies than did younger adults, but analysis of the data showed this was due not to age but to lack of background and experience with the type of device.

Takeaways

- ✧ People use different types of strategies in correcting errors. During user testing and observation, collect data on which strategies your particular audience uses. This information will be helpful in predicting future issues and in redesign.
- ✧ Don't assume that a population will be unable to finish a task just because they're older. They may do it differently and it may take more time, but they may be able to complete as many tasks as younger people.
- ✧ In addition to thinking about younger versus older people, think about novices versus experts. All older people are not the same. Just because someone is 60 years old doesn't mean they lack experience with technology. It's possible for a 60-year-old to be a computer geek who has used computers for a long time and has lots of knowledge. It's also possible for a 20-year-old to have less experience with a particular product, device, or software.

HOW PEOPLE DECIDE

The way people decide to take an action is less straightforward than we think. In this chapter we look at the science of how people make decisions.



PEOPLE MAKE MOST DECISIONS UNCONSCIOUSLY

You're thinking of buying a TV. You do some research on what TV to buy and then go online to purchase one. What factors are involved in this decision-making process? It may not be the process you think it is. In my book *Neuro Web Design: What Makes Them Click?* I explain that people like to think that they've carefully and logically weighed all the relevant factors before they make a decision. In the case of the TV, you've considered the size of TV that works best in your room, the brand that you've read is the most reliable, the competitive price, whether this is the best time to buy, and so on. You've considered all those factors consciously, but research on decision-making shows that your actual decision is made primarily in an unconscious way.

Unconscious decision-making includes factors such as:

- ★ What other people are deciding to buy: "I see that a particular TV got high ratings and reviews at the website."
- ★ What is consistent with your self-story: "I'm the kind of person who always has the latest thing, the newest technology."
- ★ Whether you can pay off any obligations or social debts with this purchase (reciprocity): "My brother has had me over to his house all year to watch the games. I think it's time we had them over to our place to watch, so I'd better get a TV at least as good as his."
- ★ Fear of loss: "This TV is on sale, and if I don't buy it right now the price may go up and I might not be able to buy one for a long time."
- ★ Your particular drives, motivations, and fears.

UNCONSCIOUS DOESN'T MEAN IRRATIONAL OR BAD

Most of our mental processing is unconscious, and most of our decision-making is unconscious, but that doesn't mean it's faulty, irrational, or bad. We're faced with an overwhelming amount of data (millions of pieces of data come into the brain every second!), and our conscious minds can't process all of it. The unconscious has evolved to process most of the data and to make decisions for us according to guidelines and rules of thumb that are in our best interest most of the time. This is the genesis of "trusting your gut," and most of the time it works.

Takeaways

- * To design a product or website that persuades people to take a certain action, you need to know the unconscious motivations of your target audience.
- * When people tell you their reasons for deciding to take a certain action, you have to be skeptical about what they say. Because decision-making is unconscious, they may be unaware of the true reasons for their decisions.
- * Even though people make decisions based on unconscious factors, they want a rational, logical reason for the decisions they make. So you still need to provide the rational, logical reasons, even though they're unlikely to be the actual reasons that people decided to take action.

One of my favorite pieces of research on unconscious mental processing was conducted by Antoine Bechara (1997) and his team. Participants in the study played a gambling game with decks of cards. Each person received \$2000 of pretend money. They were told that the goals were to lose as little of the \$2000 as possible and to try to make as much over the \$2000 as possible. There were four decks of cards on the table. Each participant turned over a card from any of the four decks and continued turning over one card at a time from the deck of their choice until the experimenter told them to stop. The subjects didn't know when the game would end. They were told that they earned money every time they turned over a card. They were also told that sometimes when they turned over a card, they earned money but also lost money (by paying it to the experimenter). The participants didn't know any of the rules of the gambling game. Here are what the rules actually were:

- ★ If they turned over any card in decks A or B, they earned \$100. If they turned over any card in decks C and D, they earned \$50.
- ★ Some cards in decks A and B also required participants to pay the experimenter a lot of money, sometimes as much as \$1250. Some cards in decks C and D also required participants to pay the experimenter, but the amount they had to pay was only an average of \$100.
- ★ Over the course of the game, decks A and B produced net losses if participants continued using them. Continued use of decks C and D rewarded participants with net gains.

The rules never changed. Although participants didn't know this, the game ended after 100 cards had been turned over.

THE UNCONSCIOUS MIND PICKS UP THE DANGER FIRST

Most participants started by trying all four decks. At first, they gravitated toward decks A and B because those decks paid out \$100 per turn. But after about 30 turns, most turned to decks C and D. They then continued turning cards in decks C and D until the game ended. During the study, the experimenter stopped the game several times to ask participants about the decks. The participants were connected to a skin conductance sensor to measure their skin conductance response (SCR). The participants' SCR readings were elevated when they played decks A and B (the "dangerous" decks) long before they consciously realized that A and B were dangerous. Their SCRs increased when they thought about choosing the A and B decks before they even touched them.

The unconscious knew that decks A and B were “dangerous” and would result in a loss. This was evidenced by the spike in the SCR. However, that’s all unconscious. Their conscious minds didn’t yet know that anything was wrong.

Eventually participants said they had a hunch that decks C and D were better, but the SCR shows that the unconscious figured this out long before the information reached consciousness. By the end of the game, most participants had more than a hunch and could articulate the difference in the two decks, but a full 30 percent of the participants couldn’t explain why they preferred decks C and D. They said they just thought those decks were better.

Takeaways

- * People respond and react to unconscious signals of danger.
- * The unconscious acts more quickly than the conscious mind. This means that people often take actions or have preferences but cannot explain why they prefer what they do.

PEOPLE WANT MORE CHOICES AND INFORMATION THAN THEY CAN PROCESS

If you stand in any aisle in any retail store in the U.S., you'll be inundated with choices. Whether you're buying candy, cereal, TVs, or jeans, you'll likely have a huge number of items to choose from. Whether it's a retail store or a website, if you ask people if they'd prefer to choose from a few alternatives or have lots of choices, most people will say they want lots of choices.

TOO MANY CHOICES PARALYZES THE THOUGHT PROCESS

Sheena Iyengar's book *The Art of Choosing* (2010) details her own and others' research on choice. In graduate school Iyengar conducted what is now known as the "jam" study. Iyengar and Mark Lepper (2000) decided to test the theory that people who have too many choices will not choose at all. They set up booths at a busy upscale grocery store and posed as store employees. They alternated the selection on the table. Half of the time there were six choices of fruit jam for people to try, and the other half of the time there were twenty-four jars of jam.

Which table had more visitors?

When there were twenty-four jars of jam, 60 percent of the people coming by would stop and taste. When there were six jars of jam, only 40 percent of the people would stop and taste. So having more choices was better, right? Not really.

Which table resulted in more tasting?

You might think that people would taste more jam when the table had twenty-four varieties. But they didn't. People stopped at the table, but they tasted only a few varieties whether there were six or twenty-four choices available. People can remember only three or four things at a time (see the chapter "How People Remember"); likewise, they can decide from among only three or four things at a time.

Which table resulted in more purchases?

The most interesting part of Iyengar's study is that 31 percent of the people who stopped at the table with six jars actually made a purchase. But only 3 percent of the people who stopped at the table with twenty-four jars actually made a purchase. So

even though more people stopped by, fewer people purchased. To give you an example of the numbers, if 100 people came by (they actually had more than that in the study, but 100 makes the calculations easy for our purposes), 60 of them would stop and try the jam at the twenty-four-jar table, but only two would make a purchase. Forty people would stop and try the jam at the six-jar table, and twelve of them would actually make a purchase.

WHY PEOPLE CAN'T STOP

So if “less is more,” then why do people always want more choices? It’s part of that dopamine effect. People want more information. It’s only when people are confident in their decisions that they stop seeking more information.

Takeaways

- ✧ Resist the impulse to provide your customers with a large number of choices.
- ✧ If you ask people how many options they want, they will almost always say “a lot” or “give me all the options.” So if you ask, be prepared to deviate from what they ask for.
- ✧ If possible, limit the number of choices to three or four. If you have to offer more options, try to do so in a progressive way. For example, have people choose first from three or four options, and then choose again from a subset.

In *The Art of Choosing* (2010), Sheena Iyengar describes an experiment with rats. The rats were given a choice between a direct path to food and a path that had branches and therefore required choices to be made. Both paths resulted in access to the same food in the same amounts. If rats only wanted food, then it seems logical that they would take the short, direct path. But the rats continuously preferred the path with branches.

In experiments with monkeys and pigeons, the animals learn to press buttons to get food. When given a choice between one button and multiple buttons, both monkeys and pigeons prefer multiple buttons.

In similar research with humans, people were given chips to use at a casino. They could use the chips at a table that had one roulette wheel or at a table where they could choose from two roulette wheels. People preferred the table with two wheels, even though all three wheels were identical.

Even though it isn't necessarily true, people equate having choices with having control. For people to feel they are in control, they need to feel that their actions are powerful and that they have choices to make. Sometimes having many choices makes it harder to get what they want, but they still want those choices so that they feel in control of the decisions.

People have an innate desire to control their environment. This makes sense, since by controlling the environment, they likely increase their chances of surviving.



The need to control starts young

Iyengar describes a study of infants as young as four months old in which the researchers attached the babies' hands to a string. The infants could move their hands to pull the string, which would cause music to play. Then the researchers detached the string from the music control. They would play music at the same intervals, but the infant had no control over when the music would play. The babies would exhibit sadness and anger, even though the music was still playing at the same intervals. They wanted to control when the music played.

Takeaways

- * People need to feel that they're in control and that they have choices
- * People won't always choose the fastest way to complete a task. When you're deciding how your audience will accomplish a task with your website or product, you may want to offer more than one way, even if the alternative methods are less efficient, just so that people will have a choice.
- * Once you've given people choices, they'll be unhappy if you take those choices away. If a new version of your product includes improved methods for accomplishing tasks, you may want to leave some of the older methods in the product so that people feel they have options.

Say you're out for a Sunday bike ride on your favorite path, and you come across some kids selling lemonade. Do you stop and buy lemonade? Do you like the lemonade? Does your buying or liking the lemonade have anything to do with the wording on the sign next to the lemonade stand? Apparently so.

Cassie Mogilner and Jennifer Aaker (2009) from the Stanford Graduate School of Business conducted a series of experiments to see whether references to time or to money would affect whether people stopped to buy, how much they were willing to pay, and how satisfied they were with the products they bought. They conducted five experiments.

SPENDING TIME VS. SPENDING MONEY

The first study was the lemonade stand previously described. Sometimes there was a sign that said, "Spend a little time, and enjoy C & D's lemonade." This was the "time" condition. Sometimes the sign said, "Spend a little money, and enjoy C & D's lemonade" (money condition), and other times the sign said, "Enjoy C & D's lemonade" (control condition).

A total of 391 people passed by either on foot or on bikes. Those who stopped to purchase lemonade ranged in age from 14 to 50, and there was a mix of gender and occupations. Customers could pay anywhere from \$1 to \$3 for a cup of lemonade—the customer decided on the price. The authors comment that the high price was justified by the fact that the customers got to keep the high-quality plastic cup. After customers drank their lemonade, they completed a survey.

More people stopped to buy lemonade when the sign mentioned time (14 percent). In fact, twice as many people stopped when time was mentioned as when money was mentioned (7 percent). In addition, customers in the time condition paid more money for the lemonade (\$2.50 on average) compared to the money condition (\$1.38 on average). Interestingly, the control condition was in between on both the number of people stopping to purchase and the average price. In other words, mentioning time brought the most customers and the most money, mentioning money brought the fewest customers and the least money, and mentioning neither was in between. The same was true when customers filled out the satisfaction survey.

The researchers came up with the hypothesis that when you invoke time in the message, you make more of a personal connection than when you invoke money. To test this idea, they conducted four more experiments in the lab rather than in the field to see how the messaging affected people's ideas about purchasing electronics, jeans, and cars.

PEOPLE WANT TO CONNECT

At the end of all the experiments, the researchers concluded that people are more willing to buy, are willing to spend more money, and like their purchases better if there's a personal connection. In most cases, that personal connection is triggered by references to time instead of money. The idea is that mentioning time highlights your experience with the product, and this thinking about the experience makes the personal connection.

However, for certain products (such as designer jeans or prestige cars) and for certain consumers (those who value possessions more than experiences), personal connection is better highlighted by mentioning money more than by mentioning time. These people are in the minority, but they are out there.

Takeaways

- * The best thing to do, of course, is to know your market or audience. If they're influenced by prestige and possessions, then by all means mention money.
- * Be aware that most people, most of the time, are more influenced by time and experiences that produce a personal connection than by money or possessions.
- * If you don't have the time or budget to know your audience well and if you're selling nonprestige items or services, then err on the side of time and experiences, and delay the mention of money as long as possible in the flow of the task you are designing.

You have just been offered a new job. The work is interesting, and there's more money, but there are downsides too. You'll probably have to travel more and work longer hours. Should you take the new job or stay where you are? Your gut tells you to go for it, but when you sit down and make a list of pros and cons, the cons outweigh the pros, and the logical method tells you to stay put. Which will you follow: your gut or your logic?

Marieke de Vries (2008) and her team conducted research to find out. They were interested in the intersection between mood and decision-making strategies.

Participants were shown a video clip of a funny part from a Muppets movie (happy mood) or a clip from the movie *Schindler's List* (sad mood). Next they were shown some Thermos products (products that keep food or beverages hot or cold). Some participants were told to choose which Thermos they'd like to win in a lottery based on their first feeling (intuitive condition). Other participants were instructed to evaluate the different products in terms of the pros and cons of their features and attributes (deliberative condition).

After the participants chose the Thermos they preferred, they estimated the monetary value of their Thermos. Next they filled out a questionnaire that measured their current mood and lastly filled out a questionnaire that rated their usual style of decision-making, intuitive or deliberative.

Here is a summary of their results:

- ★ The video clips worked in terms of getting people into a happy or sad mood.
- ★ Participants who usually make intuitive decisions estimated the value of the Thermos higher when given intuitive instructions.
- ★ Participants who usually make deliberative decisions estimated the value of the Thermos higher when given deliberate instructions.
- ★ Participants in a happy mood estimated the value of the Thermos higher when making an intuitive decision, regardless of their usual decision-making style.
- ★ Participants in a sad mood estimated the value of the Thermos higher when making a deliberative decision, regardless of their usual decision-making style.
- ★ There were no gender differences.

Takeaways

- * Some people tend to make decisions intuitively, and others tend to make them in a deliberate way.
- * People will estimate a product to be of higher value if they can make the decision in their "natural" style.
- * If you can find out someone's style, you can suggest to them how to make a decision, and that will result in a higher estimation of the value of a product.
- * You can influence someone's mood easily with, for example, a short video clip.
- * People in a good mood will rate a product as being more valuable if they are asked to make the decision quickly based on their first feelings.
- * People in a sad mood will rate a product as being more valuable if they are asked to make the decision in a more deliberate way.
- * If you influence people's mood, then you can suggest to them how to think about their decision-making process. This will result in a higher estimation of the value of a product or service.

Walk into any office building in the world and you'll find the conference rooms filled with groups of people meeting and making decisions. Every day, thousands of decisions in businesses and organizations are made by groups large and small. Unfortunately, research shows that group decision-making has serious flaws. But there are some relatively simple steps that improve group decisions.

THE DANGER OF GROUPTHINK

Andreas Mojzisch and Stefan Schulz-Hardt (2010) presented people with information on prospective job candidates. Everyone received and reviewed the information on their own first, not together in a face-to-face group. One set of participants received information on the preferences of the other people in the group before they began the review of the material, and another set of participants did not receive information on the preferences of the group before their review. Everyone then received the same information on the candidates. To make the best decision, participants would have had to review all the information given to them.

The researchers found that people who received information on the group's preferences before reviewing the candidate information did not review the candidate information fully and therefore did not make the best decisions. In a memory test, they did not remember the most relevant information. The researchers concluded that when a group of people starts a discussion by sharing their initial preferences, they spend less time and less attention on the information available outside the group's preferences. And they therefore make a less than optimal decision.

Mojzisch and Schulz-Hardt did a follow-up study in which they changed the situation so that the group was together face-to-face. In this study, each group member had different information about the potential job candidates. They could reach the best decision only if all the group members shared their unique information. Again, if the group started by talking about their initial preferences, they paid less attention to the relevant information during the discussion and made the wrong decision.



Ninety percent of group discussions start with group members talking about their initial impressions. The research is clear that this is a poor idea; instead, by starting the discussion with relevant information, this data will be weighed more carefully for a better decision.

BUT TWO PEOPLE CAN BE BETTER THAN ONE

The wide receiver catches the football right at the corner of the end zone. Is it a touchdown or not? Two referees saw the play from two different angles. Are they more likely to make a correct decision if they talk about it or if they decide individually? Research by Bahador Bahrami shows that “two heads are better than one” if they talk together and if they are both competent in their knowledge and skills.

Bahrami (2010) and his team found that pairs do better than individuals at making decisions as long as they freely discuss their disagreements, not only about what they saw but also about how confident they are about what they saw. If they aren’t allowed to freely discuss and they just give their decision, then the pair does not make better decisions than an individual would.

Takeaways

- * Give people a way and time to consider all relevant information on their own before they see what other people think.
- * Ask people to rate how confident they are in their decision before they show that decision to others.
- * Once opinion-sharing starts, make sure people have enough time to discuss their disagreements.
- * It’s easy for people to share information ahead of time and for that information to be widely disseminated. But this free flow of information and opinions may mean that people are collectively making poorer decisions. Encourage people to wait until the meeting before sharing opinions.

PEOPLE MAKE HABIT-BASED DECISIONS OR VALUE-BASED DECISIONS, BUT NOT BOTH AT THE SAME TIME

Kelly is in charge of choosing IT cloud services at her company. Two years ago she signed the company up for a chatbot service. There are three levels of service: Free, Professional, and Enterprise. Kelly has signed up for the Professional level each year so far.

It's time for the annual renewal. Will she renew? Will she decide to renew but switch to the free service? Will she decide to upgrade to the Enterprise level? Is there anything about the email notice or web page for the service that will either encourage her or discourage her from renewing or influence her decision about which level to choose?

HABIT-BASED DECISIONS VS. VALUE-BASED DECISIONS

There are two different types of decisions that people make: habit-based decisions and value-based decisions.

Habit-based decisions occur in the basal ganglia (deep in the brain). When you pull your usual cereal off the shelf at the grocery store and put it in your cart without even thinking about it, that's a habit-based decision.

If Kelly presses the Renew button for the chatbot software without even considering whether to change the level of service, then she is making a habit-based decision.

Value-based decisions are made in the orbitofrontal cortex (OFC) area in the brain. This is where logical thinking and mental activities having to do with planning and comparing occur. You are engaging in value-based decisions when you compare which brand of car you should buy or whether you have enough money to buy a new car rather than a used car.

If Kelly were comparing the features of the different levels for the chatbot service, then she would be making a value-based decision.

ONLY ONE OR THE OTHER

If the OFC is quiet, then the habit part of the brain takes over. This means that people are making either a value-based decision or a habit-based decision, but not both at the same time.

If you give someone a lot of information, then they will switch from a habit-based decision to a value-based decision. If you want someone to make a habit-based

decision, don't give them too much information to review. If you want them to make a value-based decision, then do give them information to review.

If you want Kelly to renew for the Professional level again, then don't give her lots of information. Let her make the habit-based decision to renew.

If, however, you are hoping that she will go up a level (not down), then you may want to give her information on her options, as that will kick her from a habit-based decision to a value-based decision.

Takeaways

- * Habit-based and value-based decisions occur in different parts of the brain.
- * When the OFC is quiet—that is, when someone is not making a value-based decision—then the habit part of the brain becomes active.
- * If you want someone to make a habit-based decision, do not give them a lot of information.
- * If you want someone to make a value-based decision, give them more information.

WHEN PEOPLE ARE UNCERTAIN, THEY LET OTHERS DECIDE WHAT TO DO

Imagine you're browsing a website to decide what boots to buy. You see a pair that looks good, but you've never heard of the brand before. Will you buy the boots or not? If you're unsure, then chances are you'll scroll down the page and look for reviews and ratings left by others. And chances are the reviews will influence your decision, even though the people writing the reviews are total strangers.

UNCERTAINTY TIPS THE SCALE

In my book *Neuro Web Design: What Makes Them Click?* I talk about the tendency to look to others to decide what to do. It's called *social validation*.

Bibb Latane and John Darley (1970) conducted research in which they set up ambiguous situations to see if people were affected by what others around them were or were not doing. Participants in the research would go into a room, supposedly to fill out a survey on creativity. In the room would be one or more other people pretending they were also participants, but who were really part of the experiment. Sometimes there would be one other person in the room, sometimes more. While people were filling out their creativity survey, smoke would start to come into the room from an air vent. Would the participant leave the room? Go tell someone about the smoke? Just ignore it?

PEOPLE TAKE ACTION ONLY IF OTHERS TAKE ACTION

What action, if any, the participant took depended on the behavior of the other people in the room, as well as how many other people there were. The more people, and the more the others ignored the smoke, the more the participant was likely to do nothing. If the participant was alone, he or she would leave the room and notify someone. But if there were others in the room and they didn't react, then the participant would do nothing.

TESTIMONIALS AND RATINGS ARE POWERFUL

Social validation through testimonials, ratings, and reviews will influence behavior. When people are unsure about what to do or buy, they look to testimonials, ratings, and reviews to tell them how to behave.



Reviews by people like me are the most influential

Yi-Fen Chen (2008) researched three kinds of ratings and reviews at a bookstore website: reviews by regular visitors to a website, experts on the topic, and recommendations from the website itself. All three types influenced behavior, but the reviews by regular visitors were the most influential.

Takeaways

- * People are very influenced by others' opinions and behaviors, especially when they are uncertain.
- * Use testimonials, ratings, and reviews if you want to influence behavior.
- * The more information you provide in the rating and review about the person who left it, the more influential the rating or review will be, especially when the description makes the reader feel that this person is "someone like me."

PEOPLE THINK OTHERS ARE MORE EASILY INFLUENCED THAN THEY ARE THEMSELVES

When I give talks about social validation—how much people are influenced by other people's behavior, such as that regarding ratings and reviews in the previous topic—everyone in the room nods and talks about how it's true that other people are very influenced by ratings and reviews. However, most people I speak to think that they themselves are not very affected. I talk about how much we're affected by pictures, images, and words, and that we don't realize we're being influenced. And the reaction is always similar: "Yes, other people are affected by these things, but I'm not."

THE THIRD-PERSON EFFECT

In fact, this belief that "others are affected but not me" is so common that there is research on it, and it has its own name: the *third-person effect*. The research shows that most people think others are influenced by persuasive messages but that they themselves are not. The research shows that this perception is false. The third-person effect seems to be especially true if you think you aren't interested in the topic. For example, if you're not in the market to buy a new TV, then you'll tend to think that advertising about new TVs won't affect you, but the research says that it will.

WHY DO PEOPLE DECEIVE THEMSELVES THIS WAY?

Why the self-deception? It's partly because all this influence is happening unconsciously. People are literally unaware that they're being influenced. And it's also partly because people don't like to think of themselves as easily swayed, or gullible. To be gullible is to not be in control, and the old brain—the part that is concerned with survival—always wants us to be in control.

Takeaways

- * Everyone is affected by unconscious processes.
- * If you're doing customer research and people say, "Ratings and reviews don't influence my decision," don't believe what they're saying. Remember that these are unconscious processes, and people are largely unaware of what is affecting them. Watch their behavior, instead of just listening to what they think their behavior is.

100

PEOPLE VALUE A PRODUCT MORE HIGHLY WHEN IT'S PHYSICALLY IN FRONT OF THEM

You go online to reorder a box of your favorite pens. Will you value the product more if the product page has a picture of the pens versus just a text description? Will you think the pens are worth more if you're in an office supply store and the pens are right in front of you? Does it matter if you're buying pens or food or any other product? Does the way the item is displayed at the time you're making the decision affect the dollar value that you put on it? Ben Bushong (2010) and a team of researchers decided to test this out.

In the first set of experiments, the researchers used snack food (potato chips, candy bars, and so on). Participants were given money to spend. There were lots of choices, and the participants could pick what they wanted to buy. (They screened out people on a diet and people with eating disorders.) Participants "bid" on the products so the researchers could find out what the participants were willing to pay for each product.

Some participants were shown only the name and a brief description of the item—for example, "Lay's potato chips in a 1.5-ounce bag." Some saw a picture of the item. And some had the real item right in front of them. **Figure 100.1** shows the results.

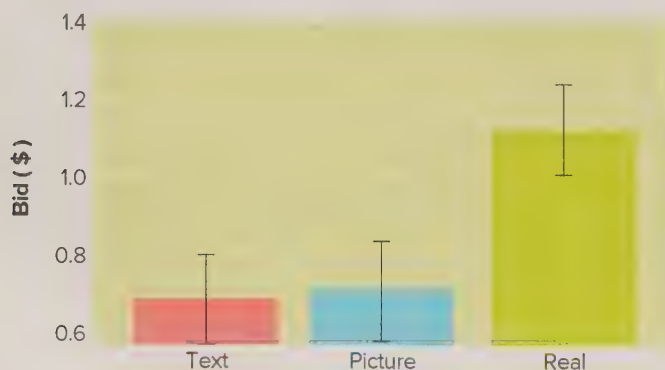


FIGURE 100.1 People valued the food more when it was in front of them

THE REAL DEAL COUNTS

Having a picture didn't significantly increase the amount of money people were willing to bid for the product, but having the product right in front of them definitely did, by up to 60 percent. Interestingly, the form of presentation didn't change how much people said they *liked* the item, just the dollar value they were willing to bid. In fact, with some

items that they said before the experiment they didn't like, they still valued them more highly if they were in front of them.

TOYS, TRINKETS, AND PLEXIGLAS

Next the researchers tried the experiment with toys and trinkets instead of food. **Figure 100.2** shows the results with toys and trinkets. The chart looks very similar as with the snack foods.

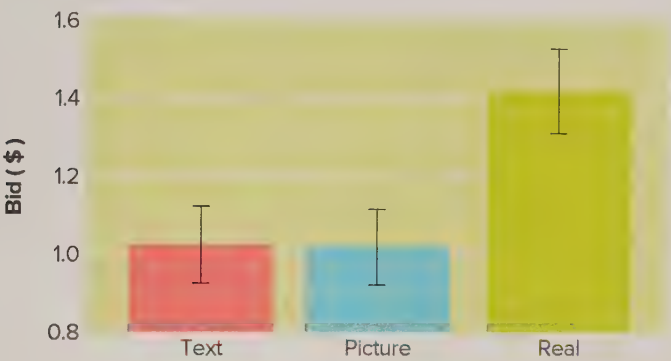


FIGURE 100.2 People valued the toys and trinkets more when they were physically present

WHAT ABOUT SAMPLES?

Deciding to try another tack, the researchers went back to food items, but this time they let people see and taste a sample. The actual item wasn't there, but the sample was. Surely, they thought, the sample would be the same as having the actual item in front of them. Wrong again! **Figure 100.3** shows that the samples were still not as powerful as having the full product available.

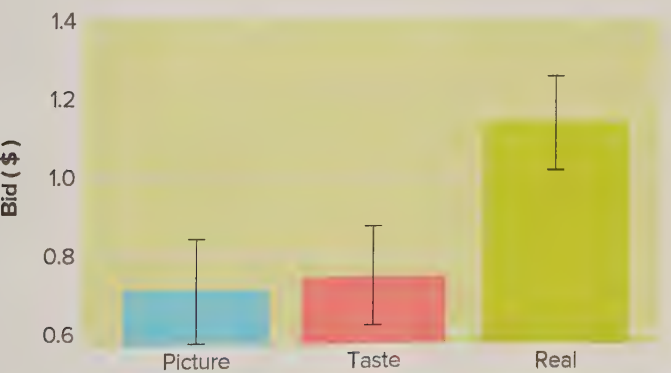


FIGURE 100.3 Samples (to taste) were less effective than the actual product

The researchers note that in this taste condition, the participants didn't even look at the samples in the paper cup, since they knew they were the same as the food in the package.

IS IT OLFACTORY?

The researchers wondered if the food produced some unconscious olfactory (smell) cues that triggered the brain, so they did another experiment, putting the food in view but behind Plexiglas. If the food was in view but behind Plexiglas, it was deemed to be worth a little more money, but not the same as if it were within reach. “Ah!” the researchers thought, “There are olfactory cues!” but then they found the same result with the nonfood items, so smell is not the trigger. **Figure 100.4** shows the results for the Plexiglas trials.

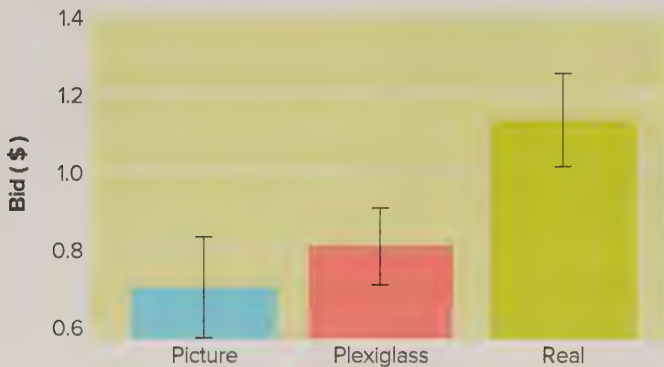


FIGURE 100.4 Plexiglas improved the value, but still not as much as having the product in physical proximity

A PAVLOVIAN RESPONSE?

Bushong and his team hypothesize that there's a Pavlovian response going on: when the product is actually available, it acts as a conditioned stimulus and elicits a response. Images and even text could potentially become a conditioned stimulus and produce the same response, but they have not been set up in the brain to trigger the same response as the actual item.

Takeaways

- ✱ Brick-and-mortar stores may retain an edge if they have products on hand, especially when it comes to price.
- ✱ Having a product behind glass or any other kind of barrier may lower the price that the customer is willing to pay.

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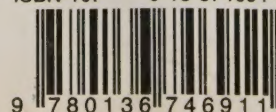
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